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SQUADRON OF DEATH

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TO MY FATHER

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SQUADRON OF DEATH

I

IN THE NAME OF SCIENCE

WHEN I was very young I wanted to fly.

I watched birds, how they glided and climbed, dived and banked without moving a wing tip. I'd never heard those terms then. Nobody had. But I saw these bird "stunts" as something human fliers would have to learn.

North Dakota, near the Canadian border, was where I met my first eagle. He was the bird I envied. He was a king. He wasn't conceited, but he knew there was nothing he couldn't do in the air. I wanted his secret.

I was good at trapping wild animals, though often I wouldn't kill them. Catching an eagle influenced my future in the air, I think. He was almost as big as I was, and as strong, with a wing spread of ten feet. He fought like a devil and almost downed me till toward the end. Then I had him, but something made me let him go. As he soared away I said to myself: "If I could do what he does!"

Next best were the nighthawks. They weren't so dignified as eagles, but what they could do nobody else could. It never bored me to go out and wait for them.

The nighthawks flew in pairs, male and female. They had their signals in the sky. I wondered what those signals were, and I'm wondering now. We couldn't do better in

the war than copy them. They'd start together, and separate till they'd flown far apart. But on that signal they'd dive earthward, then straighten out and pass one another like streaks of lightning. As they did this they'd open their beaks to give a peculiar call. This was evidently a signal to gather speed and zoom high into the sky side by side.

The nighthawks were the only birds who did these things. Each evening in the northern dusks they gave this small spy a lesson.

It was from gulls that I learned about airplane control. They were fine to watch, particularly to see how the fledglings improved as they grew older and lost their young gray feathers. They practised using their wing tips and their tails, making a stream line with their feet.

I wasn't born in Dakota, but in Minnesota; and of a legal family, with a few famous surgeons here and there. I was supposed to follow in the footsteps of my father, who was a lawyer and rose to Chief Justice of the Supreme Court of North Dakota.

Our town of to-day wasn't much of a town in my bird-studying days. Then it was a dot on a stretch of prairie, where we had cowboys for neighbors who, when they drove their herds to market, used to get gay and shoot off their guns to frighten the tenderfoot. Maybe my feet weren't tender! Anyhow, I wasn't afraid of the cowboys, so they let me go with them, and taught me to ride bucking horses bareback. That experience helped me later in the air. I don't know why exactly, though there was often plenty of air between me and a broncho's back.

All through this period I had a number of other boys to play around with in Dakota, to say nothing of girls, whom in those days I detested. But my gang didn't all care about the things I cared for, for if they took any interest in birds it was merely to steal their eggs, and half of the books I read bored them. One story I liked was in a volume of Greek mythology. It was about Icarus, who might be called the first stunt airman, and is the first aviator on record so far as I know.

A few hundred years B. C. he determined to fly. He made a pair of wings, like a bird's, and might have started an air force for his country if—well, it was a big “if”! But I said to myself—this was in 1912, when I was fourteen—“Seems to me the only trouble with that guy's invention was that he made his wings out of wax, so the sun melted them before he could prove his point.”

I always studied my problems alone without asking help; and figuring out his, I thought Icarus must have lived where there were plenty of beehives, so wax was the stuff nearest to hand. I resolved, after lying awake nights in my bedroom at home, to try and make an ass out of Icarus.

The only height I had available was a barn, and the barn loft was my workshop. I hid myself and my materials there, not to rouse the curiosity of my parents; and in that barn loft I gave birth to the first glider in the history of our neighborhood. Unlike the wings that failed poor old Icarus, mine were of staunch wood and stout linen, which took all of my pocket money. When my masterpiece was complete I loved it so much I dreaded to risk it in the big adventure. I didn't think much about my own bones; it

was the fear of hurting my glider that worried me. However, the thing was born for an experiment.

Glider of those days, seventeen years ago, were ungainly things to handle, even when constructed scientifically. I was no pessimist, and I used my gray matter figuring out how to manage the apparatus, even though I had little chance of making a perfect flight. I'd tie myself to the controls and trust to luck for the trial stunt. Then, if all was right, I'd give my public demonstration on top of the Main School building. But it must be the barn roof for the first flight.

The barn I picked was no common barn, but one deserted for years, and useful in my plans not only for its remoteness but for the slant of its roof.

I got my machine onto this roof under cover of night and watched beside it till dawn while my parents imagined me in bed. At sunrise I tied myself in by the flimsy straps, and when I had cautiously noted the wind's direction I prepared to leap.

I say "prepared," but I didn't really do much preparing, for even then I had air instinct enough to know that one must never hesitate. To go clear through even with an error at a crucial moment is better than indecision. An aviator's motto in a crisis must be: "Right or wrong, go ahead!"

Tied to my glider I crawled over the roof edge, and instantly fell twenty feet before the thing gathered any lift whatever. This disappointed me, but I didn't have much time to think while I fell. Suddenly, however, the machine seemed to get the wind under its breast feathers. I hoped

again. But joy was premature. Either I overcontrolled the thing or it was built wrong, for I found myself doing an almost complete loop, maybe the first ever made. It ended by landing me head first in a pile of old manure, and when I was able to dig myself clear I felt more like an angleworm than an eagle.

As for my poor masterpiece, I had to rescue the remnants of my first crack-up with a pitchfork and bury them on the spot where they lay.

I never liked failing when I'd worked hard, so now I had to do something or count myself a failure. My next idea was inviting my friends to see me ride a bicycle around the eaves of the schoolhouse, three stories high, where I'd wanted to give my glider exhibition. They all jeered and said I was nutty. They knew I had no bicycle and could hardly ride one. But my pride made me go on. I borrowed my brother's bike without asking him, practised a bit on the ground, and more by luck than skill gave my show.

This restored some of my self-respect after the glider fluke and led to a few other experiments, such as getting out of my second-story window in the middle of the night and sliding down the side of the house to see that free winter entertainment staged by Nature: the Northern Lights.

Of course I could have looked from my window. But I liked to be out of doors alone in Nature's reception room. The lights would spread like the sticks of a fan, fold themselves, and spread again. And the orchestra music was the lonesome wail of the coyote, the sharp yap of the wild fox, and the howl of the prairie wolf. It was one of the formal affairs of the season for me.

By day, as I said, I would track and trap wild things, and the powers of observation I learned in noting their ways helped me in aviation later, especially in war flying and stunt work where an eye for detail and the habit of making instant decisions are important.

As for the snakes that infested our prairie, though I detested reptiles as most people do, watching for them, waiting for them to spring, and learning how to kill the different species gave me patience and wariness.

An aviator must learn to love or at least tolerate so-called monotony and loneliness, and I did learn some sort of kinship with Nature watching wild animals on our prairie.

Nowadays it's I who must try to cheat Death, lurking like a trapper to catch me and my best friends. Being a boy in North Dakota trained me for the strenuous life.

My parents I thought of then, and still think of, as the two best people in the world. I had a snow experience with my father on a day of blizzard which got under my skin and has stayed there.

We had only one important trail through the snowbanks in our yard. It led to a little group of outhouses, in one of which wood and coal were stored. On a stormy day I was the only one who enjoyed leaving the house, where old-fashioned hard-coal fires kept us cozy. Any chance seemed good to me, however, and once I, with a kid of my own age who had ventured over from his house, hit upon the idea of turning that one path into a sort of Passage Perilous.

We dug a hole three feet deep, fitted into it a thin slice of loose snow, and smoothed down the surface so that to an unsuspecting eye it looked like the rest of the trodden snow path. We admired this bit of handiwork so much that when it was finished we made its duplicate farther along the "white way." Then when all was ready we hid, expecting one of my brothers as first victim.

What was our dismay when from our place of concealment we saw my grave, judicial father walk guilelessly toward the first trap! Already we were too late to warn him even if we'd dared. We stayed where we were, while slowly, surely, the dignified and somewhat heavy figure of the Chief Justice moved on.

Plop! he went through the crust over the hole, and floundered in the snowy pit. But he wasn't a man to be easily defeated. He crawled out, looking like a snow man, and proceeded.

Thinking the trap a natural one, he went on only to fall into our second ambush. Repentant, I rushed out to give him a hand up, for this hole was deeper than the first. He refused my aid, but did not even then scold or reproach me. He hadn't caught sight of my companion, who saw no reason for revealing himself; but quietly he asked me to go back to the house with him, and there he explained in a lucid way I never forgot the difference between a true sense of humor and the false humor of hurting or frightening people with what is called a practical joke.

This was characteristic of my father, and the way he controlled his temper then made such an impression on me that

it has kept me from breaking into many a rage, just or unjust, and bawling out a mechanic or some other worker who happened to be under my orders.

When I was fourteen I made a model airplane from my plans and drawings.

It would have been ready sooner, but school took a good deal of my time—too much, I often thought, though I ate up mathematics. Besides, I had to work slowly. If my father had known what I was putting my mind to he would have feared that the law and I might never meet. I had to do my stuff by the light of a secret candle in a loft.

At last the day dawned when my miniature airplane was ready for the public which hadn't seen the glider. I invited all the scientists of the neighborhood, who were the rest of my own gang, to witness my triumph as an inventor. But it never came off.

The fact that I'd collected a crowd for the event ruined it. As the urchins elbowed their way near my small airplane one of them somehow got a severe push and stepped on the model, completely wrecking it.

I think no grown man could see his life's ambition break before his eyes and feel worse than I felt. But I had to gather myself together and begin again.

To console the kids for their disappointment, soon after I asked them to witness their first parachute jump. I was the jumper, and the parachute was a huge sun umbrella. I'd resurrected it from our storehouse and cut away the cloth round the central axis so as to let the air escape. This, I'd read in my books about flight, was necessary in parachuting.

My high stage was a hay loft, and I assembled my audience underneath. Proudly I unfolded my "'chute," but as I looked down at the ground I felt a presentiment that this thing wasn't going to be a success. Something I'd read came back to me. Parachutes often failed to open even in falls of hundreds of feet. Yet—well, I couldn't let down my friends twice running. It was up to me to give an exhibition; and I really don't think I was afraid, for I never experienced the ordinary fears of childhood. My horrors were of the imagination, such as those brought by nightmare and waking visions. (For instance, I was always seeing two dark-colored crosses standing before me at a distance in the sky. Now I've got their copies in miniature, one under each arm. The scars came from a fire stunt in which I practically burned to death. But that was years after my parachute experiment.

I may have hesitated a minute, wondering if I could think of a bigger height to choose, when one of the boys yelled, "You're afraid!"

That settled it!

I stepped farther back into the barn itself, figuring that, with a running leap, I could get more wind pressure under the "'chute." I little knew how the wind banked up inside a parachute!

"One-two-three!" and I ran for the open loft door. Holding the 'chute far out and above my head, I jumped.

For part of a second it seemed like success. But in the following part of that second the umbrella collapsed, turning wrong side out, and I dropped straight as a plummet.

The next thing I knew my mother was bending over me.

She was sobbing and crying and I didn't have breath enough or wit enough to explain that I was the victim of a scientific experiment.

Poor mother, how she suffered for me, not then alone, but often—and I suppose will always suffer!

I knew a woman who said when her boy climbed trees she "fell from every branch." My mother makes higher falls than that these days, I'm afraid. And once when I was a baby she saved my life at the risk of her own and the cost of many terrible burns when our house caught fire and she was alone there with me. Her eyebrows and lashes and all her beautiful long hair caught fire, and most of her clothes burned, scorching her flesh when she lost her way in the smoke, her child in her arms. One would say I was too young at the time to remember this experience, yet it must be that I recall it subconsciously. In my fire stunts and accidents now, occasionally I seem to see this old picture. I don't like fire.

II

A MAIDEN FLIGHT

I WANTED to be an aviator, but my father thought otherwise. He put his foot on that ambition, as my kid friend put a foot on the model plane.

I resigned myself to be a lawyer, and when I left school at sixteen for the University of Minnesota I meant to work hard and qualify for that profession. I couldn't interest myself seriously, though, in anything but mathematics. My brother, A. G., only five years my elder, was associate professor of sociology and anthropology. He let me alone and never tried to "boss" me, so I was free to go on with mathematics. But maybe I shouldn't have gone far if it hadn't been for a certain Miss Thorpe. She was one of the best of the university professors, and seeing I was keen she encouraged me, giving me lessons in her own home, so that I was able to major in mathematics. I owe her part of any success I may have made in the air, for a working knowledge of mathematics is needed not only in "stunt" crack-ups, but in the organization which prepares them.

When I went home to Dakota for my first summer vacation my father must have been disappointed with my progress along legal lines, but he asked few questions and left the subject of my future alone. So did I, but I thought

of little else. And then something happened which made the desire of my life come true.

I went alone to a county fair at a town not far off, and there was a professional flier, a civilian named Roberts, doing airplane stunts which would be nothing now, but were good then, and gave me a real thrill.

I strolled up near the plane and stared. Roberts saw me. He was a grown man but hadn't forgotten what it felt like to be a boy. He noticed me as he might have noticed a pup wagging its tail for a bone. The pup got the bone, in the shape of a word and grin from the godlike flier.

He let me talk for hours, and answered a hundred questions. But at last he had to get rid of me.

"Well, it's about time to take off," he said, and my face must have fallen several inches out of plumb, for suddenly he asked, "How would you like to go round with me as my assistant, making the fairs? That's my job for the rest of the summer."

I thought I must be dreaming, but I wasn't.

"What about it?" he repeated, and while answering as quietly as I could, "Sure, you bet I'd like it," I came to a decision. I would go with him, even if my parents objected. Nothing should prevent me from having this experience.

But I didn't need to defy my father and mother. Seeing how my heart was set on the adventure, they consented, hoping most likely that I might get fed up with the whole darn business.

The matter was settled in a few hours, and next day I had a good look at Roberts's ship. It was an old pusher type, but compared to it the throne of England would

have been mud to me. I fussed around until I must have been more of a hindrance than a help to Roberts.

Through the rest of the summer I scrubbed that old boat's wings and cleaned its motor, never tiring or getting bored. It seemed so reliable I would never have thought it could let us down!

However, that is what it did. In one of Roberts's ordinary stunts the motor quit, and there was a terrific smash. Even though the high speed of the ship was but fifty miles an hour, Roberts was badly hurt. He would be incapacitated for some time, which meant the cancelling of several good contracts. To me, a boy, it looked like a fortune lost.

Roberts wasn't much more cheerful than I was, even when a brilliant idea popped into my head. Why couldn't I, under his instructions and with the aid of hired workers, rebuild the damaged ship?

He agreed that this was a good plan, and as I was carrying it out a voice would whisper, "Why can't you take the ship up?"

I knew I was capable of controlling it after all I'd learned; and maybe my childish experiments and failures had given me something, before I began picking up practical knowledge from Roberts. What was the use of working with a real flier months on end, even sitting in the seat sometimes to taxi the contraption in and out of the Fair tents that were our hangars, if I weren't able by now to fly the ship? Why, I knew the controls as I knew the inside of my hat, though I'd never been off the ground.

I mustered courage, when the plane was fully repaired and Roberts still out of action, to propose the plan to him.

He was crippled and so were his contracts, but he also crippled my ambition. Hell, no, he couldn't trust a blankety-blank kid with his valuable property!

I had to give in, for the ship was his, not mine, but I felt pretty sick. So the matter might have ended if one of the men with whom Roberts had contracted for an exhibition hadn't come to see him, and seen me first. I don't know how it was, but my confidence in myself must have lit up some spark in him, for he advised Roberts to give me a chance, being anxious not to disappoint the home folks. Also he offered extra pay if the stunt came off.

Roberts called me in and repeated the conversation. "Try the ship," he said. "If I see you can make a good take-off and a good landing, why I may trust you for the exhibition."

We didn't waste any time, for the thing had to be decided. If Roberts couldn't keep his contract, the first on his list after his crash, someone else would have to be found and signed up.

He limped out to his makeshift hangar with me, and I think his face showed more worry wrinkles than the Pacific Ocean has waves!

To climb into the seat and strap myself there was easy. Then the motor was going, and almost mechanically I taxied down the field, with help on each wing tip. So far so good, but what if I crashed and ruined Roberts's ship?

Well, it was too late to change my mind, and luckily the instant I faced into the wind I felt a confidence in myself I had never felt before. There was an exultation mixed

with it which I had never known. Sitting out there in front with the ground so close to me, I knew I could do it.

The steady purr of the motor was music, and then I gave it the gun. The plane moved. It was travelling along the ground fast now. One wing dipped dangerously, and I moved the ailerons quickly to counteract. Then it dipped on the other. I remembered the advice of the expert. "Be careful of overcontrol. Keep good speed always. Don't try to climb; it will do that itself." Then the wheels bounced and I was off.

For the first few seconds I didn't know what was happening, till the natural "feel" seemed to come to me, and after a few erratic miles I decided to bank.

Soon I began wondering why everyone considered this flight thing such a scientific accomplishment. Presently I found out. I was still in the air, but I had yet to learn that landing was the most difficult of all tasks. A ship will almost take itself off, nearly fly by its ownsome—but landing!

I came in with the poor wires whistling and singing, and when I thought the thing had lost its flying speed I drew back rather suddenly on the controls. Immediately I shot up like a skyrocket. Fortunately I gave it the gun and nosed the machine earthward, thus avoiding a stall.

After a few gulps and a couple of sighs, again I turned earthward. The wheels hit first, then the tail, then the wheels, then tail. In fact, I made five perfect landings. Never did I ride a bucking broncho that was rougher. After those five landings I got all of it on the ground together and turned to Roberts, who limped toward me.

I braced myself for a scolding, and expected to be called a this and that, a thus and a so—such words as I had heard the flier shout at others. Instead, his face beamed.

“Good kid! Knew you’d do it. A little sloppy, but it’s still all together. Natural flier. Guess you’ll have a job next year—not with me.”

He put his arm around my shoulder and led me into the tent hangar, where he dragged forth a bottle of Scotch and offered me a stiff drink in an old tin cup. I had never tasted the stuff, and didn’t like it. It was not in use at our home. But I wanted to oblige him. I took one small sip, then coughed and choked until I had to spit it out.

At that time I had never smoked, drunk, danced, or kissed a girl. I did not even drink tea or coffee.

I can still say I don’t drink coffee.

III

THE FIRST UNIT OF DUNWOODY

COLLEGE again!

But war clouds were black over the whole world, and in 1916 I wanted to go across with the Canadians, or, though I was under fighting age, try to join the Lafayette Escadrille.

I got off my feed and study, but A. G., my professor brother, snubbed me by saying children weren't wanted over there. Suddenly, however, he decided that he couldn't bear to say out of the scrap himself. This was when America went in, and with A. G. gone there was no influence to hold me back. I didn't consult my parents before I decided that I would enlist.

What I wanted was a commission, because without one I couldn't hope to fly. But A. G. wasn't the only person who called me too young. The army wouldn't have me.

That was a blow, but not a knockout. I presented myself at the U. S. Naval Recruiting offices, where a hard-boiled C. P. O. looked me over from head to foot.

"Not taking any enlistments," he growled, and turned back to his work.

I was dumbfounded, for I had only just stepped over the doorsill.

I stood where I was till someone brushed me out of his

way, a buzzard of about thirty-five. "Aw hell, what are you taking up room for there?" he grunted. "Somebody else might want to use what you're standing on." Still I hung on, watching the man stride across to the desk, sign up, and go in for a "physical." Others shoved past me and followed his example. Mine was the only spot on the scene that wasn't busy getting ready for war.

At last I grew so mad that I didn't care what any hard-boiled C. P. O. might do to me. I butted into the front of the line.

"See here!" I barked. "You've got to give me a good reason why I'm not fit for your lousy navy!"

Everyone except the C. P. O. grinned or stared at the impudent shrimp. He scowled. "Run home to your mamma, sonny," he ordered. "Come back when you grow up."

"All right, if that's how bad you need aviators for the American service," I said, "I'll go somewhere else, where I can get in."

"Aviators!" the C. P. O. laughed. "What *you* need is a toy balloon."

I saw red. "You—you——" I stuttered. "You're just a low-down——"

Which is where that conversation ended.

A man with three full gold stripes walked out from an inner office, evidently bound for the desk. Catching my outburst, he halted. So did I—in my language.

He looked down at me. I looked up at him. He was tall, and I hadn't quite got my growth. I'll never forget that fine dignified figure, or that stern yet not unkind face. It seemed to me that this man's smile lines were made of steel.

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Without budging from the spot where my impudence had stopped him, a commanding gesture of the hand beckoned me to approach.

"What's your trouble, son?" He focussed his eyes at me.

"Well——" I stumbled. "Well, it——"

"Come on, now," the officer cut in. "I'm busy. Never start with a 'well' or end with a 'but.' "

"I want to get into aviation, sir," I said.

For a minute he stood looking me over. Then his hard face softened slightly. "Come into my office," he ordered, leading the way. I lingered behind just long enough to give a thumb and five full fingers to the C. P. O., who half rose, a beautiful scowl adorning his leathern features.

Inside the commander's office, which was luxurious compared to the outer one of the C. P. O., I was directed to sit down.

"Now, what about this aviation?" the commander questioned me. "Want to enlist?"

"I do, sir," I answered.

"How old are you?"

"Twenty-one," I risked.

The commander grinned slightly as he looked me well over again.

"Unofficially," he prompted me, "how old are you?"

"I—might be nineteen," I hedged, my ears burning.

"Now—really how old are you?"

There was no use in lying to such a man! I knew my face was red as a beet when I told him the truth.

He made no comment, but went on. "Any flying experience?"

"Very little that would do me good in the service, sir," I explained. "But I have flown." And I painted my hectic past with Roberts, "making" the fairs with the old pusher.

"Parents mind if you enlist?" came next.

"They'd love it," I fibbed, almost seeing how my poor mother would take this bombshell.

The colonel lifted the receiver from a desk 'phone. "Hello, Lieutenant Eastman!" he called. "I'm sending you a recruit for aviation instruction. A little experience. Put him in the First Unit."

Bang!—I was in the service.

Steps were rapid in those days.

A little ground-school instruction, and then I was sent to the Massachusetts Institute of Technology. After that it was Pensacola, and finally a commission.

The ace of our unit (the First Unit of Dunwoody) in my opinion was Goldie Sylvester. All of us in the unit became friends, but Sylvester was the top card in the pack. I looked up to him because he'd already been over in France, serving with the Morgan Harjes Ambulance Corps, where he had won a Croix de Guerre with Palms and other decorations. We two in our planes would hunt each other out in the sky and play formations.

One day Goldie called me quietly aside and told me he'd overheard a conversation between our superior officers wherein it was decided that I should be held as an instructor. This made me sick. I was crazy to get over to France. I'd enlisted for action, not teaching, and I swore that at any cost I wouldn't be stuck in America.

I took to the air to think the thing over in peace, and just

then Sylvester was taking off in squadron formation, having Position No. 2 on the right. Blair of Philadelphia held No. 3 on the left. The others I didn't recognize. We waved to each other as we parted for our morning's flight, and when the lot of us were in the air I trailed the squadron.

I was in a tough mood over what I'd learned from Goldie. The thought of being kept back nauseated me, but soon there was something else to be sick about. Blair swerved in the propeller wash of No. 1 plane in the formation. At the same instant Sylvester seemed to veer in, and my muscles tautened as I saw their planes approach each other at high speed. The wings touched—locked. The ships' noses ground into one another, the two planes tore each other's guts. Then they dropped.

I nosed down and away from the damaged squadron, inadvertently falling into the first tailspin I was ever in. When I came out the planes had parted, about two hundred feet above the blue water. Blair jumped from his. Fatal mistake. The sharks got him. At least, his body never was found.

As for Sylvester, he nosed into the sea with terrible force, splashing up a huge white plume of spray as he hit. Already they had started the sea sled from the dock with a rescue party.

I went into a steep dive, only to see that the boat was far ahead. If anything could get to him in time it would. Still I went on. I couldn't help it. As I saw the men dragging Sylvester's body out of the wreckage he appeared to be unhurt. He must be all right, for there'd hardly been time for him to drown. Then when I came nearer I saw

that his head had been pierced by a long sliver of a propeller. He was stone dead.

For a few minutes I was stunned with grief. That sliver in his brain seemed to pierce mine too, and for the moment I almost wished it had, as I took what I thought must be a last long look at my friend. I was mistaken, however. It was not to be the last.

He had a rather unusual face, and as he lay there, open-eyed but unseeing, his features impressed themselves upon me as they never had before. Everything photographed itself on my mind: the wrinkled brown forehead, the large pores, almost like pits in his tanned cheeks, and the full, firm chin. The deep smile lines seemed determined even in death, and though they were sad there was an expression of peace which no one who saw it could forget.

Well, he at least had lived, and had had his chance to do something worth while. I hadn't, and wouldn't if what he warned me of, almost with his last words, came true. I promised myself again that it should not be so, and at that moment I made a plan. It was as if the shock of Goldie's death brought it into my mind.

Life had to go on!

After goosing my motor a couple of times I gave it full gun and took off.

An hour later I reached the altitude of five thousand feet in my seaplane and then straightened out. Deliberately I set myself to do a thing absolutely forbidden on the station—stunting in a seaplane.

It was a crime against discipline that ought to mean a court-martial and dismissal from the service which I'd

taken so much trouble to join. This sounds like fool's play. But it wasn't. I knew what I wanted to do and what I wanted to happen.

I looked far down upon our hangars. They, and everything in the miniature station where they expected to keep me as an instructor while others went to war, seemed of no account, though I knew well enough that all would gain in importance, as in size, the nearer I got. *I* would be the little and unimportant object. But I didn't care!

I dived and looped, spun and climbed and banked until the old motor just wheezed and died. A forced landing! Yet I nosed not into the wind but with it, toward the landing beach. My finish was perfection. Not a bounce; and more gold braid was lined up there as spectators than I'd ever before seen assembled.

Itily the group eyed me, as with the most casual air I could muster I jumped from the pontoon of the ship to the shore. The senior flying officer sternly ordered me to report to the executive officer, and he in his turn sent me to the captain's office.

In my dirty flying clothes, my face bespotted with engine mud, I must show myself before the Grand Old Man! But I had let myself in for what was due, and though I didn't enjoy it I had no regrets. This was the one and only time when I wasn't obliged to wait and cool my heels in an outer office. Without a moment's delay I was ushered into the presence of my very austere superior. And "austere" was the word!

His hair was almost white. A rather becoming Vandyke beard adorned his dignified features. There was something

about him which told of clean living. His eyes were clear and keen as an eagle's.

"Sit down, Ensign Grace," he commanded. And these were his only words for a while. Leaning back in his swivel chair, the G. O. M. looked me squarely and very thoughtfully in the eye in stone-cold silence till I began to wriggle. Under that gaze I felt like an undressed model on display in a shop window. But presently he leaned forward to study some reports on the desk. From them he turned to a small book. I knew it was my service record.

Still without speaking, he half turned from me and gazed contemplatively out of the window on the vast rows of hangars and machine shops.

"Ensign Grace," he said at last, "your record is clean up to the present. I see no serious infraction of any rule of the navy in your past. Yet to-day you have committed an offense against discipline which can't be overlooked. Your life is not your own at present. It belongs to your country. You know very well that seaplanes aren't built for stunting. You must realize as I do that you are guilty of an act which is unfair to me as a brother officer."

"Yes, sir," I admitted.

"Then what is your excuse, if any?"

"I want a court-martial," I answered, giving him look for look.

"A court-martial?" he repeated, astounded.

"Yes, sir, and a conviction and a discharge."

"You talk like an insane man!"

"To-day I heard that I was to be made an instructor and have to stay here. I want to go to France! The one

chance I can see of doing that is to be discharged and try to get into the R. F. C."

He made no comment upon this statement. He bent again over the papers. "You are confined to quarters until further notice," he said without a change of expression.

I went out disheartened, realizing that my plan might have failed after all. It was a cinch for a court-martial! *But* a court-martial would do me no good if the sentence should ground me forever. I needed to fly if I were to get to France.

For three days I moped. No one came to see me. I felt like a prisoner. Then, at the close of the third tedious day, I was recalled to the high executive's office.

The curt recognition of naval officers passed between us. I noticed a long folded document in the hand that could make or break me. Evidently the order for my trial.

"Read this," the G. O. M. commanded.

I took the paper he held out, expecting to see my worst fears confirmed. But the farther I read, the higher my astonishment mounted. This was not an order for court-martial, but a command to proceed to Washington and from there directly to Paris.

When I looked up, red and pale perhaps, the Grand Old Man was smiling.

Bang! I was in the war, as unexpectedly as I had entered the service.

IV

THE PARIS OF MANY STORIES

THE war!

I was in it, but not in the way I wanted. It seemed that I was doomed to be placed with squadrons which got little or no chance of action.

It was my ambition to become an ace, not for the glory of it, but for work and adventure; just as in these days, after nine years behind the scenes for "stunt" pictures, I don't spend weeks and months in preparation with my Squadron of Death and risk my life and theirs for glory. We get little of it, but it is our life or our death, and it's worth while.

So it was in the war. Individuality was merged into the mass. A soldier or a flier was more or less comparable with one vote in a general election for President of the United States.

I was first detailed with the Northern Bombing Group stationed near Otange not far from Dunkirk. Things were too slow for us, and I began to think I had a jinx, that if I'd apply for a transfer to another squadron I'd be sure to get into a more or less dead one.

At last talk reached our ears of a big offensive on the Italian Front. That sounded good to me, and by manœuvring I got a transfer.

Before starting for Italy, however, it was necessary to report in Paris. There I would receive definite assignment.

I hurried through Paris after landing in France, but had seen nothing of the city of which we Americans had heard so many stories. Now I was to have ten days' leave with time to see the sights and enjoy myself.

One thing impressed upon my mind by Sylvester's death and countless death since was the fact that sooner or later the war was bound to "get" us—especially us aviators. None had lasted long, and none would last much longer than those who had passed on. Members of the R. A. F. in those days came on the scene only to be bumped off and replaced by others with whom the programme would be repeated. Their R. E. S.'s were nothing much but flying coffins. Even the famous Camel, which gave me a thrill because it was the trickiest and the most sensitive type on control, was far from an ideal fighting ship.

For this reason I and the rest looked forward to Paris after Dunkirk as a joy hop. It might be our last. It wasn't strange if we decided to make the most of it.

There was a strange atmosphere hanging over Paris then. Everyone must have felt it, we more than others, because it was there for us. Wherever we went, in streets, boulevards, parks, theatres, restaurants, all-night cafés, there was this heavy atmosphere. An atmosphere filled with love and hate. All kinds of love—for us.

I had never smoked. I had never drunk anything stronger than Coca-Cola, except for the one nip of Scotch that Roberts had forced down my throat. I had never kissed

a girl; in fact, only once had I tried it. I almost got the kiss, and I did get my face slapped.

Yet here I was in Paris, where all my friends had had adventures which they had painted in high colors when they came back from leave, so my curiosity was aroused and I decided to jump in and get my feet wet, too. I felt as though I had come to the gate of a garden. And I wasn't the only one among my friends who felt this way. We'd seen things that men older than ourselves had never faced and never will: but some of us were too young or too dumb for women. In Paris the gate was ajar. Why not go in?

As I was passing the Y. M. C. A. I bought some good American cigarettes and had my *first* smoke.

That night I went alone into the Café de Paris, which had been described to me by men of my squadron, and seating myself alone at a table I ordered a bottle of good dry champagne. I sipped a glassful, and poured down the second like water. After the third I felt warm all over, ready for anything that might come.

What did come was a glance, then a look, from a beautiful girl who sat at the table next to mine. She had no business casting glances, for she was with a Frenchman, a civilian, one of her own compatriots. But I suppose a girl feels she has a right to do what she likes with her own eyes.

Little as I knew about women, I did have the sense to understand that this girl, so quiet, so simply yet smartly dressed, wasn't of the type we could approach with "army French," and a "*Voulez-vous coucher avec moi?*" Still, the

look she did give me with those eyes was as good as a written invitation.

Perhaps she scorned her escort because he was a civilian among uniformed Allies, though doubtless there was a good reason for that, as all Frenchmen young or middle-aged, able to fight, were soldiers. Later I found out that, being an expert, he was employed in munition works near Brest; though how the girl had got herself engaged to marry him she could hardly tell.

That night, however, I knew nothing about him. He was twice my size and age, but when he saw his companion giving me glad eyes he did nothing about it except scowl.

I tried to make things comfortable all around by bowing politely, getting off a few words in my best French, and inviting the two to try my champagne instead of sticking to the red wine they had on their table. I proposed the health of France, so a Frenchman could hardly refuse. Anyhow he didn't, and he and I had a few drinks, then more when I'd ordered a second bottle of champagne. The *petite* dark-eyed dame didn't help us much, but she went on looking, until her fiancé got up and insisted on taking her away. She could speak a little English, he none at all.

I thought I'd lost her, but I was mistaken. She gave me my cue, saying that her friend could leave if he liked. She preferred to stay and drink the health of the American service, especially aviation.

I felt like a home breaker, but when I arose and offered to go Mademoiselle said "No." Monsieur flew into a rage at this, and when she threatened to move to my side of the table, with one move he upset it.

The girl and I got a bath of champagne. It was then my turn to spring up, my legs wet with wine, and I did it so brusquely that the poor Frenchie must have thought I meant to go for him. He jumped, made for the door, leaving his bill to me, to say nothing of his girl; and the last we saw of him through the big plate-glass windows, he was running as if he had an escaped tiger in pursuit.

I think the girl was really frightened. She hadn't meant to show off or make trouble. She was just tired of her pasty-faced civilian among so many uniforms, and she wanted to meet an American officer. I was her first American, as she was my first flirtation.

She wasn't bold in her manner with me, yet she made me feel she liked me partly because of myself and partly because I was one of the Americans who had come out to help France. She didn't want to part from me, and if she felt like that I didn't see why I should part from her. She was pretty, and kind, with little caressing ways which seem, as I recall them, to belong only to the Paris of those days. I went with her where she wished me to go, and stayed with her as she wished me to stay. I hope if she ever remembers me now, when perhaps she is happily married, it may be some satisfaction for the girl to know that I can never forget her or those days in which I seldom went anywhere without her.

Little Thérèse and her native Paris made a man of me.

V

MEET ITALY

AFTER my leave I travelled to Rome only to be sent to Lago di Bolsena, where I was to be attached for temporary duty.

When I arrived I was greeted by a number of friends, including one of the best, Leonard Reno of Chicago, and we all held "another of those reunions."

I wanted to see the Lago di Bolsena from which we were to do our flying, so some of us wandered down the long lane which led to our hangars and the main station. We were billeted near an old castle of Nero's, which was interesting, but I was much surprised at the lake. It seemed so small.

"Small!" repeated Pee-Wee Laurence, one of the first Americans to blow up a submarine. "That's all your imagination. This is a deceptive piece of water, and much bigger than it looks."

I glanced across thoughtfully. "Well," I said, "maybe you're right, but at that I bet I could walk around it in twenty-four hours."

Instantly I got the horse laugh.

No one dislikes more than I do to have his judgment impeached. So, after giving them a dirty look and study-

ing the lake for a minute, I burst out with the bright remark:

"Nothing to bet that I can't do what I say?" I repeated.

Of course they couldn't sit still under this, so together they dug up six hundred lire that I wouldn't be able to win such a bet. It was then two o'clock in the afternoon, and twenty-four hours later I was due to earn or lose the six hundred.

Time came for me to start, and the German hobnailed boots which I wore were probably the only things befitting such an adventure. The rest of my clothing was a pair of worn Bedfords, a khaki shirt, and the camel's-hair lining out of my short leather coat. I had no canteen nor flashlight.

The first few miles were easy, smooth and level. Then I ran into a sort of swamp, through which I had to wade. This was bad, as the heavy boots filled up with water and rubbed my feet with every step.

These little discomforts, however, were but a beginning! Farther on a huge mountain dropped sheer, cliff-like sides into the lake. I had my choice of climbing or swimming, and chose to swim, which saved time and trouble, but when I found a landing place I was wet as a seal.

Over mountains, through streams, I wandered till about eleven at night. By that time I was a bit tired and hungry, but I figured that I must have done almost half of the distance I had to travel to win my bet, which wasn't so bad.

I was feeling fairly pleased with myself when I broke into a little village. Not used to Italian towns, language, or customs, I can hardly blame myself for mistaking a

rather superior-looking peasant house for a small restaurant.

In some countries I mightn't have received a very pleasant welcome, pounding at the door of somebody's home in the middle of the night, but the fat, middle-aged woman who peered out into the darkness took pity on me and let me in as soon as I spoke the magic password "*Americano*."

It was one of the few I knew, but it, and the expressive gestures I made toward the region of my stomach, won me a supper. It was only after I'd drunk what seemed to me some choice wine and eaten the tastiest food I'd had since leaving home that it occurred to my hostess and a few friends who'd dropped in for the show to catechize the foreigner calling himself "*Americano*" and "*soldato*," though he wore no uniform. We all did our best to clear up the mystery with much waving of arms and shouting, but after a parley which I couldn't understand, a deputation went out to find an interpreter. They thought it worth while to wake up the mayor of the village, who could speak English and especially American, having been a barber in Boston, Massachusetts.

I was delighted to see him, and hoped I'd found a friend, but he was quite the high Italian official now, and his Boston days didn't soften his heart toward a midnight visitor more likely to be an Austrian spy than the American soldier he claimed to be.

His reasoning was perfect, even pluperfect.

If I was an American aviator, belonging to the detachment on the other side of the lake, why the devil wasn't I

in uniform? Why a coat lining instead of a coat? Above all, why those German boots? What was I doing alone at midnight so far from my station? What military mission brought me to his town? The worthy man not being blessed with a sense of humor, my explanation of the bet and my attempt to win six hundred lire did more harm than good. My story was too far-fetched. If I had made up a simple lie I'd have had a better chance of selling myself to him.

He wanted to march me off to jail, but my hostess, who seemed to be on friendly terms with His Honor the mayor, interceded for me. I looked like a real American to her, and anyhow I was tired out and not dangerous. She pleaded that it would be all right to lock me up in a bedroom in her house, where I'd have a good night's rest, and next morning if necessary I could be dragged to prison or even shot at dawn.

At last her eloquence convinced the mayor, or wore him out, but he insisted on seeing for himself that a stout door was shut on me and the key turned in the lock.

There was nothing to do but submit to the law and bide my time. I was thankful that I hadn't to pass the night in a lousy village jail, but I wasn't as cheerful as I seemed. Not only would I lose my bet, which was certain now, but at best, if I were set free in the morning I couldn't get back to my station till late the next night, and there'd be the devil to pay.

I sat on a clean-looking bed to think over the situation and wonder what, if anything, could be done, especially about the window, when I heard a key grate in the lock. The door opened and framed my hostess, smiling and nod-

ding. She was not alone. With her were two young girls, evidently her daughters. At first I couldn't understand what she wanted. But some actions speak louder than words, and when I found that the girls were brought for me to choose from it was too much for my Minnesota morals. I was shocked. A minute before I'd had only two things to worry about, and both of them concerned getting back to the station. Now I had more.

I was the panic-stricken one, not the signorinas, but realizing that their ideals were just different from those at home, I tried to be polite as I waved the ladies away.

The mother of the two charmers, one of whom was really pretty, seemed to be in despair how to please the *Americano*, and offered me both girls. That was too much, and I pushed all three out, pure but panting. They retaliated by turning the key in the lock with a vicious wrench, and there I was worse off than ever.

I felt I had no time to waste, since I now had enemies instead of friends in the house, and again I concentrated on escape.

Quietly I opened the window, which had a narrow balcony underneath, and I laughed as I saw that it was no more than twenty-five feet above the cobble-paved street.

Cautiously I got out on the balcony and hung there suspended. At that hour I hoped the villagers were all at home in bed, but no: someone was out late. I heard an ungodly scream and let go. Luckily I landed on my feet, lightly despite the German boots, and stopped only long enough to decide which way to go.

From an open window my Three Graces waved their

arms and shrieked. People were popping up everywhere. The alarm would turn into a spy hunt, the popular outdoor sport of civilians in the war. Luckily Italian villages are easy to hide in. The dark, narrow streets were rabbit warrens, and soon I lost the crowd that quickly gathered to chase me. I was just ready to give them a last "razz-berry" when, turning a corner, I met the whole mob. This time they were too close for me to dodge.

The chase was on. The only leg the alleged Austrian spy had to stand on was in a German boot, and the bet begun in a joke was a bad one against me from now on. If I got caught I'd be held for interrogation before being turned back to the Americans, so I managed to skid round another corner on two wheels. I ran into one of those blind streets famous in foreign countries. This one was a wow! A wall fifteen feet high, but it meant nothing to me then. I think I touched about three of the rough rocks as I scaled it, and I tumbled over on the other side without looking down. People shrieked as I fell. They must have thought it was the last of the spy! When I did look, by the dim light of the moon, I got the shock of my life.

I had landed on a ledge, and four hundred feet below I could hear the water of Lake Bolsena *shushing* against the cliffs.

Cautious crawling along the narrow path for some hundred feet finally led me into a graveyard. Anyhow, I was out past the village boundaries. *

The wine I had drunk at supper was in my head. Evidently it was stronger than ordinary *vin rouge*, and good

as it had tasted I regretted taking it. However, I fought down the effects and tumbled along in the direction that seemed right. What with the red wine and the pale moon I was never sure of my footing. But the path grew smoother and more level beyond the graveyard, though it travelled along the edge of the cliff about seventy-five feet above the lake. I was beginning to think I was out of the woods at last when the pathway turned abruptly to the right—and I went right on. My left foot fell into space. Turning completely over, my head hit next. That was all I knew.

When I awoke I was lying in the bottom of a boat. I could hear a peculiar, monotonous plunk-plunk, and opening an eye I was surprised to find I was moving. An Italian with a single long oar was paddling from the back of the craft. Later I learned he had picked me up where I fell, and not knowing that I was a suspected spy had proceeded to deliver me to my station. He told me that it was ten o'clock A. M. So I'd been unconscious about eight hours.

This was my initiation into Italy—scenery, manners, and customs; especially scenery.

Not only was I out the six hundred lire, but I had to reward the boatman. And the horse laugh was still on me. The rest of the time I remained at my station the Italians would lift their forefingers and shake them in a peculiar way, indicating that something was wrong with my head, and I suppose they were right.

But I had one satisfaction. I was the first who ever crossed that gully. Everybody else walked around it. So shall I if I ever go there again.

Soon after this adventure the Big Drive came which before long, and to our great disappointment, ended the war.

Trieste changed colors. Pola was bombed. The Austrian line gave in and—the Germans gave way.

We Americans were too newly in the war to welcome the Armistice. We made a noise with the rest, but few in our sector rejoiced. We were just beginning to “go good,” and felt we had been cheated because we were obliged to stop. Still, there it was! The war was over.

VI

A BUSINESS VENTURE THAT CRASHED

OUT!

Nothing to do but go back to our old line of work—if we could get it.

I was due for a raise in commission. But I had had enough.

My companions and I scattered. Before our final farewell, however, we had one last flight. It was a damned fine good-bye party.

I went home to rest, but there was no rest. My back and foot were still weak from a crack-up, but I had to go to a dance every night and stay out till morning, or I would have been a Gloom among those who wanted to do me honor. I felt handicapped; and though after a while we became an old story, they tried to make much of us in the town of Bismarck, North Dakota. I was a fish out of water.

Since I'd gone to war Father had elected himself Justice of the Supreme Court of our state, and my family had moved from the little town of Mohall to the capital.

In this place I had no near friends, so the parties meant nothing much to me. Moreover, my father kept insisting that I go back to the University of Minnesota to continue my study of the law. After my hectic life in France and

Italy this was as exciting to me as a sermon on eugenics would be in a night club. I wanted to please my parents, however, after my long absence from them, so I let my father's reasoning win and I departed again to take up the humdrum existence of a law student.

When first mine eyes had beheld this university it had seemed a vast institution. But that was an age ago, before I "joined up" and entered the service. It was before the war! Then it had been life, not existence. I'd been a boy whose geography was learned from maps. Now I had wandered a long way and seen various countries and learned several things; among others, how to smoke, drink, and kiss, as well as dance at parties.

Buildings that had seemed big were small, and some I missed altogether, for they had been torn down. Memories I had treasured were destroyed with them. Whole streets I didn't recognize. And the students! What neophytes! I was an old man in comparison with them, too old to associate with them congenially. They were constrained with me. I was bored with them.

My fraternity brothers who had graduated hadn't come back from the war, or they baulked at returning to school. In the places they left empty were youngsters who enjoyed frivolities I could take no hand in. I felt homesick for I hardly knew what, and I realized what a fool I'd been in thinking, while on my way home from war, that the service had made no change in me. I knew better now. I had graduated into a life beyond what school could teach, and seeing this I resolved then and there that I would be no lawyer.

It made me unhappy to decide this, because I knew it would grieve my father, and I had no alternative profession to propose. I was restless. I couldn't see ahead. I had not the remotest idea what would become of me. But even to become a derelict would be better than staying in school, an old man half in, half out, of his own generation. Old at twenty!

Fate decrees unaccountably. Yet, if we want things enough, it often gives us what we ask. As I didn't want school with its soft memories and sweet girls, now my companions were gone, it seemed that I must stay with the only thing I knew.

I say "must" because if I hadn't felt driven I would have liked to please my father. But in the revolt of soul against convention I found aviation waiting with arms open. By accident, it seemed, I ran into my kind old commander who had just been relieved of duty at Dunwoody Institute.

If it hadn't been for him I mightn't have got into the service when I did. He also was back in civies and treated me like a human being. He recognized me at once, knew all about my war record and that of his First Unit. I was delighted when he said he was proud of us, and glad we had justified his judgment to some extent.

"What are you planning on doing now?" he asked.

"I wish I knew," I said. "But I want to keep in aviation one way or another."

A look of keen interest came over his face, which I remembered as so stern.

"Hm!" he said thoughtfully. "Got any money?—to put into an investment, I mean."

"Not much," I said. "Only what I saved in the war. A little over a thousand."

"Probably your father'd help you," the commander suggested, "if it was a question of your getting into a good thing."

Then he went on and explained what the good thing was. All was spoken casually as if he didn't care where he himself was concerned, but wouldn't be sorry to do me a kind turn. I'm sure he did feel that way.

I listened as he talked about a great commercial opportunity I might take advantage of, if I could get a few thousand dollars.

The government, it seemed, had stored huge supplies of aviation equipment in Midway, equipment which, now that the war was over, had become a useless burden. If I could put in a reasonable bid the commander was sure that it would be accepted. There were seventeen Standard J1's, three L.W.F.'s with 135 h. p. Thomas Morse motors, and a T. M. Scout to be sold. These would make a great display on any private field.

The scheme was dazzling, but the proposition seemed entirely too big for me. It would require at least five thousand dollars to bid in on the material, not counting money for hangars and a lease on a really good field.

Persuaded by my former superior, however, I telegraphed my father the details, and he offered to lend me three thousand dollars. As I had said, my war savings amounted to more than a thousand. So there was four thousand dollars: a big sum to me, but not enough to buy the ships.

Then fortune seemed to swing my way. Through the commander I met a man who was already deeply interested in the scheme; not a person of much education, but one who, nevertheless, struck me as trustworthy and sound. He had approximately the same amount of money I had with which to experiment with civilian aviation, so I had my excuse to throw law to the winds for the second time—and for the love of the game.

A few weeks later found us established in Minneapolis as partners, the first commercial company to have ships and start flying. I was very proud of that first adventure in business, at my age. These ships were *mine*—ours! How different the control of the stick on a ship of your own than to fly one belonging to the government! There was just one hangar, and our lease on the eighty-acre field was for but two years, yet we felt certain that everything would grow and the business become more and more stable as we became better known in the world.

One important detail, however, I had forgotten. A crash or two when in the service of the government meant nothing, while here the loss of one ship and some thousands of dollars was crushing to us. Fortune deserted us. A tornado overtook one of our ships, a Bemidji, and completely wrecked it. Immediately following this stroke of bad luck I was flying an exhibition at Litchfield, and the motor quit. A huge crowd swarmed over the whole field when I attempted a landing. To pick a spot where there were no spectators or automobiles was next to impossible. To do so meant a deliberate crack-up. But it was the one thing to do, and I did it. I was able to land on a small space, but

not able to stop taxiing before I came to the end of the field. The result was a crash into the board fence which surrounded the grounds, and another plane was damaged.

This happened on a Saturday, and was bad enough, but misfortunes never come singly. One week from that day I was flying an L. W. F. with the motor turning a good 2300 r. p. m. as I left the ground. Hardly had I got beyond reach of the field, however, when the revs dropped to 1900, then to 1500. I was barely able to keep in the air. Fourteen hundred, and I started to settle. It looked like another crack-up, and, peering over the side of the ship, I was disconcerted to find myself directly over a swamp. I had a brand new pair of Bedford cord trousers on, too! "Just my luck!" I thought.

The fuselage of these former transport ships was made of laminated wood, dangerous for a smash, though the undercarriage was of steel. A crack-up it had to be, and travelling with the wind this ought to be a good one! I wasn't disappointed. The landing carriage struck first, then the nose, and I went through more stunts in the next few minutes than I'd had in the last few months.

When the crunch of breaking wood had ceased I myself was more or less detached from the rest of the ship. The fuselage had broken into three parts, and I was in that one which had rolled some thirty feet from the rest of the wreck.

This I didn't discover until I came back to my senses. I was still holding to the stick; my trousers were mud; my goggles and nose were broken, and there wasn't enough ship left even to worry over.

What I said about that motor as I touched a match to the débris must still hold a high record in language contests. I watched the blaze with grim enjoyment, and then trudged disgustedly home from the swamp.

In that mood I didn't care much for the ship, and I didn't mind getting wet. What I was damned sore about was my new Bedford cords!

It never rains but it pours. My partner and I disagreed in principle and decided to separate.

For days I worried about what to do. I couldn't separate from him until I got money enough to repay my father what he had put into the concern for me. At least I must be able to sell out for the amount of my debt to him. But who wanted to buy an aviation field that wasn't on a paying basis? Very few would be interested in such a proposition at that time in any case, even if it had been a gold mine.

The next Saturday I had another crack-up. Motor trouble again! And this time I was forced to land in a creek, which made three crack-ups in a row. I was disgruntled through and through.

When a team of horses had drawn what was left of the thing out of the mud, I had my mechanics repair it well enough to go up. But for no good purpose! As soon as they finished the job I took the ship off the ground and deliberately smashed it. That was my way of trying to break the stream of bad luck. Moreover, this airplane had nothing but its own way, it seemed. Perhaps after this I might have my way as to where and when my planes were

to crack up! I little knew how many voluntary crack-ups I was to make after this bone experiment.

Now I was at my wit's end to know how to save my father a heavy loss yet break free from my partner. Omar Locklear helped me to solve the problem.

Locklear had just begun to make fame for himself by changing from one airplane to another in midair, and I saw that there might be money for me in the same stunt. There was danger in it, of course, and the technique had to be mastered before one could hope to succeed. But something had to be done to pick up a quick return on the failing investment, so I put two of my best pilots through special training.

I taught them to fly between two tall posts, arranged much as a football standard. Across the top of these parallel posts I put a cord with small flags attached to it, so the contraption would be visible from the air. One plane must fly under the cord and the other just above it.

When the pilots had done this trick several times I made them repeat with the same formation, higher in the air and with me on the wing of one plane. When I had had enough practice we gave out an announcement that we would do a change from one airplane to another.

So far Locklear had this stunt for himself, and we were going to be his only rivals, so the newspapers took the story up and "featured" my pilots and me.

We advertised the show for a certain day, and though our poor field was so new that people hadn't seemed to know where it was, all of a sudden they found their way.

A crowd of at least ten thousand collected to see us give our demonstration of foolhardiness.

I was elated at this sight and thought my luck had changed. All our ships used for passenger work were so busy that the motors never stopped except to refill with gasoline and oil. But at the last minute, when we were all ready to give our show before twenty thousand eyes, one of my pilots deliberately backed out. I begged and pleaded, tried to force him, but nothing I could say or do would persuade him to risk his bones. Finally I accused him of being a coward. "You're yellow!" I challenged him, but he only shrugged his shoulders.

I was desperate, and tried to find another pilot willing to attempt the stunt at this short notice. Finally I got one who had the guts, but not the experience. So erratic was his formation flying that we couldn't make a connection between the two planes, and in order not to disappoint the crowd I gave an exhibition of wing-walking. Also I did my famous "thirty-four stunts below five hundred," and our public's thirst for sensation was more than satisfied.

What I did was new and a bit different from Omar Locklear's work; but since then I have made one hundred and sixty-seven changes from airplane to airplane, airplane to automobile, and such like, and consider that sort of thing a stunt of no spectacular value at all.

At the time it was good enough to draw crowds, and soon our field was earning enough to pay our debts. When I could arrange to sell out I did, but still I couldn't return to my father all he had put into my enterprise.

I had to think up some other schemes not to let him down.

Virtue may be its own reward, but sometimes it seems to get no other!

When I had freed myself from my partner, down pounced bad luck on me again.

I started a small field of my own in Eau Claire, Wisconsin, where, after building the field and hangar and placing the rest of my equipment, I opened a series of exhibitions on the lines of my late success. But one crack-up after another dogged my course in the air. As I was taking off a field in Stanley, Wisconsin, the old accident happened: my motor quit, and I was forced to descend on stump ground. The first two or three stumps I avoided, but eventually one got me, and I flopped over on my back. This was by now no new sensation, and I had taught myself to say, whenever it occurred, "Happy landing!" Any landing, when you can get up and walk out of it, is good. But these crack-ups I continued to have were inconvenient to a young business man.

One that followed the stump incident crowned me King of Crack-ups in that part of the country. It happened at Richmond, and I'll never forget the morning when I flew in.

Eight below zero it was. Once more during the afternoon exhibition my motor chose to quit when I was on my back in a loop. This isn't a particularly pleasant sensation when you're over a city. As I did not have much altitude there was but little time for me to pick out a field. Another crack-up—and this was a pip.

I selected one of those little buildings which James

Whitcomb Riley made famous, and I landed. What I did to the little house out in back is nothing to what the little house out in back did to me.

This disgusted me with flying, so I sold the ship where it was buried, and for no reason in particular bought a ticket to Los Angeles.

VII

AN IMPERFECT LANDING

HELL's bells!

People talk of the pleasure of riding trains between one coast and another. I swore then that if I ever made enough money I'd go straight to a Turkish bath and glorify myself just in memory of those two days and nights across the desert. The one pleasure I got out of the trip was watching a fat woman across the aisle perspire more than I. And *did* she? Every time she stood up she got her feet wet.

Thank the gods I wasn't in the same seat with her. Bad enough as it was! A day coach I was in; hot, dusty, full of careless people. They were careless in everything, particularly as to where they threw their well-gnawed apple cores, and where they parked their feet.

But at last—or alas—this was Los Angeles. Apparently I wasn't greeted by the best section of the city, but it was one in keeping with my own personal appearance. At least, there would be a place to walk, where I wasn't shut up with a combination salad of garlic, onions, and shoes which had at least one fifth of the five senses I possessed.

Arriving at a destination has its advantages, but I

couldn't appreciate them fully. I didn't know a soul, had nowhere to go, and was slightly handicapped by the fact that I had twenty cents and a suitcase to carry.

The case was decrepit. It had been through the war and, like most other things subjected to that experience, suffered more than normal deterioration. I decided to discard it. So, rambling through the waiting room, I found a newspaper, took a suit and a few accessories from my one piece of baggage, and wrapped them carefully. The bundle was small compared with the suitcase. I gave my battered property one last look, then abandoned it and started for the street. Fifty feet farther on a black hand clutched my arm.

"Here you is, mister—you-all sure 'nuff most forgot it dat time"—and a colored man triumphantly held out that darned suitcase. My delight in receiving it was no greater than his in giving it, as I walked away without tipping him.

What to do with the blamed nuisance I didn't know, but I determined that, rather than lug it all around town, I'd get rid of the pest somehow. I walked on up the street; then, standing close to one of the big pillars stuck onto the façade of the station, I gently planted the suitcase on the cement. This done, glancing cautiously in all directions, I stuffed my hands in my pockets and sauntered to a safety zone.

"Hey, you!" Without a doubt the salutation was addressed to me. And I couldn't mistake the calling of the saluter. He was a policeman.

"Well?" I asked, with the air of confidence I might have

assumed a few years ago while serving as an officer in aviation.

"I been watching you. What's your game? Blowing up the station?"

"What the hell do you mean?"

"Come on—let's go over and get that suitcase. I saw you sneak it onto the pavement."

Somehow I didn't like the grip with which the officer held me as we recrossed the street.

"Open it!"

I did so.

"Close it!"

Done!

"Now, listen—what's the game?"

"Why I——"

"How much money you got?"

"How much does it take?"

"Oh—gonna get smart? Guess you'd better come with me."

"Listen," I pleaded, "I *wasn't* getting fresh. I just arrived——"

"You've already arriven."

And we went.

About ten of his comrades pounced on me at the other station, and after they had my twenty cents and everything else they could find, one of them said to another:

"Book him a 'vag.' "

"What's a 'vag'?" I asked innocently.

"Thirty days—in Los Angeles."

"But I'm going to make this my home."

"Book him 'suspicious character.' "

That was a bad day, the day of my entrance into Los Angeles. It looked as if they might have done without the first fifty per cent. of the name of the city, as far as I was concerned, for the next few weeks.

And both the officers and myself were right.

Thirty days later I emerged into the California sunlight again and the centre of the city. But I couldn't brag about my travelling time. It had taken me a month just to get from one station to another.

There's one thing I'll say, however, for that bunch of cops. They were honest. They gave me back my twenty cents—and the suitcase. This time I left all my clothes in it, though I eyed it with a certain amount of disdain. That damn thing had cost me thirty days in jail! Which ought to prove a warning for anyone who travels with luggage to southern California.

But the twenty cents was shot. A dime of it took me to Hollywood. A nickel went for some grapes. And three cents for a paper. The rest of my capital I pocketed for a rainy day.

One corner seemed almost as good as another. But I picked one that had slightly the best of it and walked unconcernedly about, the suitcase in one hand, a bag of grapes in the other, and the want ads under my arm.

My clothes were still badly in need of a press, the last neat semblance of a crease having passed away amid the luxuries of the city bastille. The hat was still stiff with the

dust of a dozen states. Altogether my appearance must have been impressive, for everyone gave me the once-over.

I had often reflected during my career that it never rains but it pours, which is just what it did at that particular moment. Without warning, a lousy cloud vomited unwelcome torrents of H_2O , placing me in the embarrassing position of having my best suit subjected to a wet wash.

There were no buildings of importance near—that is, none had inset entrances or awnings down. Luckily, however, a couple of hundred feet along the street I saw a house with an imposing veranda. In attempting a landing, I skidded, nosed over, and wiped out my undercarriage. When I regained control one hand was busily engaged replacing shirts, ties, and socks in that —!! suitcase, while the other was extricating itself from the bag of squashed grapes.

Quite a crowd had gathered to see this spectacular landing of mine. Even the veranda was well populated. I couldn't blame people for laughing—perhaps I'd have done the same thing if I'd been in their pants; but for the life of me I could see little or no humor in the situation. My underwear was wet where I'd flopped, and I'd skinned a knee. More than that, I was outraged. My luck was so rotten—I was such a jinx—that I had to bring rain to California in July.

The longer I stood, nonplussed, the louder grew the guffaws—but upon looking the mob over I decided that they were too many and too big for me to take on alone, so I continued to stand. Meanwhile the water was trickling down my shoes, and I felt nervous and jumpy.

My eyes, having taken in the immediate surroundings, then extended their rambles and came in contact with this inscription:

THE WILLIAM FOX WEST COAST STUDIOS

VIII

FROM PROPERTY TO STUNT MAN

WHEN I started west from Wisconsin I didn't know why I chose Los Angeles, unless because I'd heard a lot about the place and it had a nice name. Certainly I had no intention of breaking into motion pictures. As for aviation, I meant to leave it alone forever.

Still, with my present capital I couldn't exactly retire. Here Fate had marched me up in front of a big studio. As long as I was at the front door I might as well walk in and try to sell myself.

I noticed that a number of men who got in wore ridiculous make-ups. They had rouge on their lips and black around the eyes. The majority had their faces covered with a rather dark pink grease paint. I had none of this paraphernalia, but luckily there were some who didn't wear make-up and most of these were dressed as shabbily as I was.

Knowing now how hard it is for a stranger to get into a studio, I wonder at my own nerve. Empty pocketbooks and no place to sleep, however, sort of change a disposition.

I walked into the reception room, right past the gateman and on to the lot. Of course I didn't know where I was going, and I had that darned old suitcase. Only to look

at the thing made me ill. While I stood there with it in my hand, not quite sure what to do, who should pop out of nowhere but Jasper Blystone. "Jap," as we called him, was a friend from Eau Claire, and if you don't think I was glad to see him at this turning point of my career it's because you've never been up four thousand feet without wings.

He was equally glad to see me; asked what I was doing, where I was flying, and so forth. To this I answered with a fair amount of truthfulness. As for him, it seemed that he acted as property man for his brother Jack Blystone, who at the time was directing Slim Summerville in two-reel comedies.

Jasper introduced me to the troupe, and thirty minutes later I had my first job—that of an assistant property boy!

I want to say here and now that no job is so tough as that of a property man in a comedy company. He is first at work and last to leave; and when there's nothing else for him to do there's always a make-up to put on for a few hours.

People who are not satisfied with their positions in life have only to wish, and work hard enough, and I believe a change will come to them. I was ambitious to get on in the world and reach one of those high marks for which others strove. Well, I got the opportunity.

To go from the property room to the wardrobe department it was necessary to pass the sky backing. One of the companies was making a thriller which called for a forty-foot net dive. The cameras were set in position. Everything was in readiness for the stunt man to do his leap. He was

supposed to turn over twice in the air before he hit the net. Now I had never had any training in acrobatics, except what I needed for wing-walking, but I had been able to do fancy diving in college. Therefore I thought it would interest me to see the technique of a real performer.

The director gave the word. Cameras started to grind. But the stunt man still stayed where he was. A second call from the director had no more effect. No fall was forthcoming. Cameras stopped. A lot of warm talk followed: all from the director. The man on the platform didn't say a word, but with a rather hopeless gesture he turned and walked slowly down the ladder. He was through! He knew it and so did I, even though I was a novice in the game.

Of a sudden my heart beat faster. Why should I not try the stunt? It appealed to me. It would be a thrill, especially as it was a tough spot for a tryout. One man had failed, and he a professional, whereas I knew nothing of flip-flops, front or back flips. If I failed to deliver the goods I, too, would be through.

I met the stunt man as he hit the last step of the ladder and asked him for the double's coat. My trousers were a near enough match to get by. When I was dressed I ran up the ladder to the platform.

"All ready?" I shouted.

The assistant looked at the director, and the director at the assistant. They held a short consultation. "Jump when I give you the word." The order came floating up to me and the director sat down in his chair.

The cameras clicked again. I was getting nervous;

almost wished I hadn't been so quick in my decision. Then I heard that one fatal word, "Jump!"

When I got it I was so startled that one foot slipped off the stand. The next minute I went tumbling and turning, down toward the net. As I gathered speed I felt that thrill, right in the belly, which only a high fall can give. And just about the time I was beginning to enjoy it I hit the net.

There are accidents that kill and others that save. Unaccountably I hit to perfection, square on my back between the shoulders and the base of the spine. No one was more surprised than I was, as I got up slightly bewildered.

"Great!" cried the director. "That's the most natural fall I've ever seen on the lot. Most of them look too professional. There'll be no retake on that!"

Then turning to me he asked, "What's the name?"

"Dick Grace."

"Funny, I've never seen you work before. Who you working for?"

"William Fox."

"Oh, yeh! Well, you're working for the St. John Company from now on."

And I was. Immediately I slipped the word to Jasper Blystone—and then and there I "exchanged titles."

From that time on I was a Hollywood stunt man.

IX

INITIATION TO THE DEATH SQUADRON

I LOOK back now on that pitiful stunt with a smile; it was really so simple to do and had such a small margin of risk. But it did give me confidence and excited me to greater daring.

I trained. I learned how to do high net dives. My sense of balance was always good, but from my comrades I learned how to handle my body while in the air. Malvern, Cornelli, and Eddie Tacoma, the best tumblers on the coast, took infinite pains to teach me their tricks.

Out of their competent hands I emerged as a high diver for nets and water. I was something of an equilibrist and race driver; also I was a good swimmer both on top and under the water. My aviation work in the war and after had made me a pilot of some ability and an aërial trapezist.

In consequence of all this I found no difficulty in getting work. During my first year at Hollywood I averaged about one hundred stunts, or almost two a week. In this number I include only the dangerous ones. There were others which held little element of risk for a trained man, and so are not worth counting.

After that successful year I was completely broken in, but not broken up. I had smashed only two ribs in the

whole twelve months, which I considered exceptional luck.

That year of experience made me decide never again to do any small stunts. I'd leave those for amateurs, having now graduated from the rank and file. By the end of the twelfth month I had divided stunts into two classes: major thrills, such as changing from one airplane to another and from airplane to automobile and speedboat; wrecking of automobiles; any high or fire dive above fifty feet; and intentional crashing of airplanes.

Minor stunts included dives under fifty feet in which there was no element of danger. Such an ordinary thrill as a "wire stunt," in which a man is suspended in a leather belt attached to a long piece of steel piano wire, to swing from place to place, is small stuff. I banned it for myself. Also the automobile chases, used so often in comedies. The last of these which I did consent to do required me to jump from one taxicab to another several times while the two taxis were making between twenty-five and thirty miles per hour.

Another similar stunt had me standing on top of an automobile making about the same speed. The camera car travelled parallel with us and the automobiles were about thirty feet apart. Such shots are called "running inserts." At a given signal I jumped from the top of one car to the pavement, landing flat on my chest. Of course I was partly able to break the fall with the hands; but four times I had to do this in order to get what seemed to the director a satisfactory result.

As for skidding automobiles on wet pavements, at the end of that first year I refused them, too, unless there was

a worth-while crash at the end, or unless I did the thing for pleasure. Naturally there is a technique in such skids, and my technique had improved with practice, although it had cost me about a hundred dollars to perfect it. The money wasn't paid to an instructor, but to the police department.

This little incident happened in San Pedro, on one of the main thoroughfares. Because it was midnight there was little or no traffic, and rain was pouring down in torrents. What better time could there be, I thought, to practise a few skids? Maintaining a speed of fifty miles per hour, whenever I came to an intersection I pushed on the brakes, making the car turn dizzily. It rather vexed me because I couldn't go completely around more than three and a half times at the first corner I tried. I repeated the experiment at the next, but imagine my dismay when I looked back and caught sight of two motorcycle policemen. A cinch to be arrested! But now that I was fairly caught why not get the worth of my money through some more experience? I treated myself to another skid at the next corner, and the policemen, fearing to come too close because of my gyrations, continued to signal me with arms and sirens. I thought I saw quite an angry expression on one of their faces as once more I did the trick. That time was the last. I succeeded in making the four ground loops, but my motor died.

Small stunt as this was, I firmly believe that a knowledge of skidding is invaluable to any motorist, because a car is no more out of complete control in a skid than an airplane is in a tailspin. However, where and when to get

practice remains a problem. I'll say that I never skidded after that incident unless I got paid for it.

One more resolve I made at the end of the first year. Besides that of giving up minor thrills I decided not to stunt for comedy companies, since they cannot afford to pay prices in accordance with the real value of the feat.

It was shortly after making such resolutions that I was hired by the Fox Company for an eighty-six-foot high dive from the Rainbow Arch. This natural archway is situated on the Island of Santa Cruz.

In the picture I was doubling for Henry Walthall, and as I remember the story, this was supposed to be a suicide leap. Actually it was that, for unknown to me the stunt had to be done under treacherous conditions. Such affairs are generally blind to us stunt men, as we have no time to survey the situation before we take a thing on, and sign the contract.

Arriving at the island, John Ford (who was directing) and I got into a little power boat. We had with us the crew necessary to shoot the scene, and immediately we headed for the arch. It was then I learned that I wasn't to dive from the arch itself, but from a cliff which formed an L with it. I did not like this because the ocean breeze funnelled into the arch, causing peculiar air currents near the concave base of the cliff from which I was to dive. Then again, as I surveyed the sea and measured the depth at the time of tide when I was to do the stunt, I found the water would be only six feet deep. Below was a jagged, rocky sea bottom. If I waited until a wave surged under and through the arch I would have rather deeper water,

but I couldn't be sure of this slight advantage. The surface was covered with seaweed. Instantly I remembered how Bobby Dunn had been hurt by a mere match floating on the surface of a tank.

However, I climbed the mountain to look the thing over from the top. There was an old diving board, whose presence surprised me very much. Certainly no nut would choose this as a place to do high dives! Later I found that it had been built by a movie company a couple of years ago for the same stunt which I now faced. Also I discovered that but two persons had ever attempted the thing. One was a professional woman diver who broke seven vertebræ when she hit, and the other was a native who was killed in the attempt.

I glanced at the springboard and asked if it would be all right for me to use it for the picture, the cliff not being vertical. The rocks bellied out about twenty feet from the top and then, as I have said, curved inward near the base. John Ford agreed that I might use the board, and I was on the point of stepping out on it to look the situation over further, when I decided to test the thing before venturing my weight on it. Leaning forward, I grabbed hold of the board with one hand. Imagine my consternation when it broke back with such ease that I was almost thrown off my balance. Had I stepped out on it I would have crashed down on the cliff, rolled, and fallen the rest of the way to the water. A narrow escape! It wasn't like most of us stunt men to test such a board, which one would certainly not expect to find dry-rotted. But a sudden rush of caution to the head has saved me on several occasions!

Final preparations for the dive were made. The cameras were set up in a launch anchored about a hundred and fifty feet from the cliff. An expert diver in bathing suit stood by in a rowboat manned by a powerful athlete. In the boat was a lead-weighted rope and a life preserver. These precautions were taken in case I should hit wrong and be stunned or injured. Also, should I hit the rocks below and not come to the surface, the rope would be useful! It could be lowered over the side near my body and the diver would have little trouble in fastening the grapple-end around me.

The first-aid kit was on board and opened. A glass of whisky was poured, for the air struck cold, and after the dip the stimulant might be needed to restore vitality.

Word was given me when all was ready and I climbed the cliff.

As I stood on its very edge, after finding a firm, safe footing, I glanced down just once at the spot I knew I was bound to hit. Then I turned my eyes away. That has always been my custom. I find that one sharp look just before the leap, after you have picked your place, makes for greater concentration than a long, steady stare at the spot.

The cameras started to grind. In a few seconds it would all be history—one way or another. Those interminable seconds just before the director drops his hand as a signal are always harrowing. I saw the rower lock his oars in the boat and get set. The diver was on the prow of the boat. The director's hand was raised high. That was my signal.

My eyes shot to the spot and I got into position. I must

jump out at least ten feet to clear the part of the cliff that bellied out. Yet I couldn't afford to overbalance.

The muscles of my legs tightened as I crouched for the leap. Then the legs straightened and I sprang. For just a moment I thought that I couldn't clear the ledge, and I moved my arms and head to change my course. It meant that I would have to turn a front flip or what we call a "full."

I was relieved when I saw the cliff pass by my head. Then I concentrated on making the dive. But I had neglected to take into consideration the deceptive wind which funnelled through the gap. As I struck it I was thrown off balance, and tried to make a "one and a half," which means a complete fall and a half landing on my feet. Dangerous with shallow water, but I was powerless to do better.

Now I was nearing the waves, and entirely out of position. It couldn't be helped, so suddenly I gave up trying for the classic one. Just one quick movement and I flopped on my back. It would be a heavy blow I'd get, but better than being dashed on the rocks below. I wondered quickly what would be the result. Well, I wouldn't have long to wait before I found out! . . . I hit. The spout of water that rose was huge as I disappeared under the surface. There I turned completely over, just grazing the rocks.

Quickly I came to the surface and swam to the boat. My back was stinging, but my face was smiling. I had just completed one of my shortest flights. All had happened in less than two and a half seconds, and I had another major stunt to my credit.

INITIATION TO THE SQUADRON 67

But the break of luck that I got on that stunt can't be counted upon by every stunt man.

Silvertip was working for Ruth Roland several years ago. He was possessed of splendid nerve but had no extraordinary amount of judgment. Not that he lacked judgment in an ordinary way, but the sense has to be overdeveloped and speeded up for successful stunting. It is my contention that the best men in our game are those who are high-strung, and Silvertip was not that.

One of the many stunts he did required him to jump from a fast train into a lagoon over which the railroad had built a trestle. The leap was not very high, but neither was the lagoon wide. Silvertip, therefore, had to time his departure with the nicest exactness. Should he leap too soon or too late he would land on the bank on one side or the other.

Before getting on the top of the train, he found that he had left his "double's" shoes at home, and in the pinch he borrowed a pair from Bob Rose. Bob was, and is, like that. He would give you his shirt and never ask to have it returned.

When they were ready to take the "thrill" the train was moved back far enough to accumulate the proper speed. Then it came on.

Silvertip could be seen approaching the side of the car on which he was to stand. He was in a crouched position ready to jump, with one hand holding the slight support afforded by the top of the car and the other raised in position for diving.

Within a few hundred feet of the bridge Bob Rose

remarked that the train was making plenty of speed and continuing to pick up momentum with each stroke of the engine pistons. Would Silvertip take this into consideration when he made his leap? Black smoke was pouring out of the stack, and flowing back over the cars: not enough to interfere with the jump; nevertheless it was disagreeable.

Now was Silvertip's moment. Still he did not move. Soon it would be too late and they would have to make a retake. The train rumbled on. At that speed, if Silvertip should go, he might be carried beyond the lagoon. Yet he was crouching and getting ready. Then he jumped. With his arms stretched forward, and his legs far apart, he—hit the bank! He had waited too long. The train's speed carried him beyond his mark, and there he lay, a broken, crumpled mass. He had made his last leap—dead. He too had joined the Squadron of Death.

Bob Rose took off the shoes, and he told me later that whenever he put them on after that there came over him a most peculiar sensation. Walking in the shoes of the dead, he never felt sure he wouldn't follow Silvertip all the way.

However, we are not a clan who can afford to dwell long upon the misfortunes of our comrades. As a matter of fact, we oblige ourselves to cultivate an element of the impersonal in our work. I suppose we realize that eventually ours will be the fate of those who have preceded us. The way of all stunt men: either death or insanity. Because they say that "Dead men tell no tales," before I join that Squadron of the Dead I'm going to put just a little bit of

our history on record. We don't amount to anything and I guess that the world won't be interested in an account of us, living or dead. But perhaps this squadron of mine, who come back to me in the dark middle of the night to stare with leering, smiling, or tear-stained faces, may wish to have their history told. At least no one who reads can say again in watching "movie stunts," "of course that's only a fake."

I don't know what the consequences of my work may be. And I don't care. Tales of these dead men do not die for me. They are retold in my brain nightly, and so I give them away to the world outside.

I was too young in the game at first to think as seriously as I do now. Then I was ambitious to "get somewhere." Where? God only knew. What a pitiful fool I was to hope that a man could climb the ladder of success on this work!

I began to see the grim reality of our game, though, when I went out to an aviation field where some of the new arrivals in flying put on their amateur exhibitions. A man was telling me one day how he could stunt at an unsafe altitude. I warned him that I thought he was foolish, but of course I was not well known on the coast in flying, and he laughed at me. I had a notion to go up and show him how the thing he meant to do ought to be done. Having no ship at the time, and as there was nothing at stake but my opinion, I left the amateur to prove that his own ideas were right—if he could.

Just as I was about to leave the field I heard a terrific crash and, turning, saw the dust pouring up from a bunch of wreckage. A few minutes before that tangled mass had been an airplane with a man in it.

X

CHANCES SUCCESSFUL AND UNSUCCESSFUL

THE poor damned fool! He ought to have known better! There he was all crashed to hell—his head splattered to the size of a washtub—one arm grotesquely stuck through his right side and protruding on the left, just below the heart. His legs were still entangled in the jumbled mass of wire, linen, and wood that had been an airplane. Well, a few minutes before he was a stunt aviator. There he lay, now a shapeless mass of dirty mud. No semblance of features left, not a quiver of a muscle. I laughed grimly. I had told the poor fool that he couldn't do it, and I was right. Down below he must be beating the rusty hinges of hell, waiting, with his brevet of the devil, to join the rest of the unearthly clan. He had died in the cockpit, simply because he put too much confidence in the ability of a motor to pull him out of a low loop. But now he had new wings—black wings, like those of a vampire, only larger.

His name? It doesn't matter. After all, he was an amateur, and who the hell cares about one of them? He died like a chicken, without a squawk—and he had none coming!

How much it takes sometimes to kill a human being—

and others, how damned little! But it was not for me to philosophize. I had work to do, work of a kind which can't be interfered with by thoughts of those who go crashing into hell. A last look at the blanched faces of those who had gathered around, eager with morbid curiosity, and I left the field. Like a hill of ants were these humans, with their excited voices, their wish to gather in mobs and rush to the aid of those beyond help.

From the field to the William Fox Studios was some distance, and I arrived none too soon to prepare for the stunt for which I had contracted. It had nothing to do with aviation, since if you are a good stunt man you must know all the angles involved in the different phases of motion pictures. On a certain day you might be ordered to make a drop from one airplane to another. The next stunt called for might be a high dive, or the wrecking of an automobile, or any of the many and various forms of hazard which fill the lives of the haunted. This particular stunt of mine was somewhat unusual. A five-story front had been built on the isolated section of a street set at the rear of the lot. From the foreground it appeared very realistic, with the doors closed and the "backings" for the windows in place. But behind those windows I knew that cans of black powder had been poured. Huge piles of paper and old film, highly ignitable, were scattered about, and to make it even a warmer place the whole interior of the building had been soaked with gasoline. This was to be a fire scene, and knowing Bernard Durning, the director, I surmised that it would be as true to life as possible.

I went to my dressing room in Tin Pan Alley to put

on the so-called "double" clothes I wore for *The Fast Mail*. Strangely enough, this time I felt none of the usual exhilaration that had buoyed me up through all my former stunts.

Perhaps it was because of the boy's death in the ship; or was it that I was getting fed up with the game? Just one stunt after another and no chance of rising above it all! Before I came to the West Coast I had been a fairly well-known stunt man, had owned my own aviation field and given exhibitions. Before that there had been the war, which had taken me to France and Italy as an officer in the Naval Air Service. My life seemed destined to be one of sensation. How I wished now that I could be like the majority of my fraternity brothers at the university. They could come back and forget the war. By this time most of them were professional men. My father had begged and insisted, but I, like a fool, would stay with aviation! The result, I saw, would be that I'd stay with the damn game until it got me too. Just a lousy stunt man!

I rambled back to the set, a lively scene now. An old-fashioned fire engine was puffing and smoking at the far end of the street, and all about the place were firemen from the Hollywood station. Shirley Mason, Buck Jones, and a few of the other principals were grouped around the cameras. Extras were gathered in knots here and there, and with a little imagination it was easy to think this the real East Side of New York.

My appearance on the scene was a signal for activity. Cameras were moved to their final positions, extinguishers and the chemical hose cart were strategically placed.

Extras were warned to keep from the danger zone no matter what might happen.

"Are you ready?" asked Durning.

"Last instructions?" said I.

"None but these," he replied: "After the fire is lighted wait until I give you the signal. Then and only then jump into the fire net. There is nothing to fear. We have real firemen to handle the net, and plenty of equipment to put out the blaze."

"There's only one thing," I said. "Be sure to warn them to place the net clear of the wires." I nodded toward some telephone wires which were strung parallel to the windows of the third story, and at a distance of about ten feet from them.

"Don't worry. They know their business," said Durning.

As I climbed the stairs to the fire wall I noticed more gasoline and film being loaded into the fake backings, and knew that I was in for a hot time.

As I stood there I made a quick survey of the situation. Cement below, about a sixty-foot jump, and nothing to go to should——

"Light the fire," came from Durning.

There were a few seconds of intense silence as the men with torches approached the building.

A moment—then all was chaos. Everyone had expected a brief interim before the building should be swept with flames. But not so! There came a sort of puff, an explosion, and the entire building and myself were lost in flames. I stepped back to avoid the fire, but there is little protection on a three-foot fire wall. Great tongues of fire shot out into

the street and defied the helpless little engine. Through the flames I could see that it was impossible for the firemen to stand the heat. Twice they tried to get the net near enough for me to jump. The scene which had been so peaceful a few seconds before was now pandemonium. Women were crying; men were hysterical. The director most of all seemed to have lost his self-composure. Poor Durning, he always did that! I could hear him helplessly shouting: "For God's sake, get that net under there! Do something, you damn fools!"

The flames were scorching now. I noticed the heat raise a blister on one of my arms. I was a sap—a fool! Now it was my turn to join that squadron of the dead. Soon the devil would be handing me my new brevet, and I'd go crashing into hell. But not by burning. I'd jump to the pavement first.

A last effort of the firemen, and they got the net almost in place. *Almost!* Right under the wires. But it gave me a chance—my only chance. I knew that to stand there five seconds longer would be worse than taking the chance. I dived headfirst toward the pavement, and shivered as I saw it rise up at me. Then as I passed the wires at the third story I put my hands far out behind me. I felt the wire slide past the muscles of my arms, and partly closed my hands. A sudden jerk! I had caught there momentarily, flipping my body under the wires and into the net. A few seconds later the whole wall collapsed.

This finished "shooting" on that set for the day. Also it finished me for several more. The burns were superficial,

from the heat alone, but they were too painful for me to continue stunts, at least for a couple of days.

I had seen one thing on the set just before my stunt that interested me more than the stunt itself—a girl. She was only an extra, but I couldn't recall a woman with such an innocent and trustful face. Certainly, I thought, she should be a star. She had big blue eyes, blond hair, and was very slender. I'd been in pictures some time and never had I met even a famous star with so much natural appeal.

Harry Cornelli, the celebrated tumbler of Ringling Brothers Circus, who was also on the picture, told me that her name was Georgie Smith. I should certainly have liked to meet her. If I could have done so it would have paid me for the burns.

After Harry gave me the information I wanted we went over to the cashier's and I collected my hundred for the stunt I had done. That was one time when I earned all that I got, even if the Irishman, Kelly, in the casting office did think I was a highway robber. There was a casting director with a heart, but try to find it.

It seemed good to go around with a lot of bills in the pocket. It made me feel as if life was an enjoyable thing, after all.

We gathered up Pauly Malvern, another acrobat and stunt man, also Duke Green, Harvey Perry, Dick Dickinson, and Dick Curwood, all of whom belonged to our class. After a little dinner, during which they told me how lucky I was to be alive, we adjourned to Baldy's, a soft-drink parlour in front, with a place to play cards and get other drinks at the back. About one o'clock in the morning

I walked home, happy because I still had luck in my work.

Things were rather slow for a while after that stunt, which means that money was scarce, and I had to go back to the old diet of one meal a day. However, a small company was making two-reel comedies just then. Louise Fazenda and Chester Conklin were the stars, and I was asked to work for the outfit. The name of this concern was Warner Brothers. Nobody cared to work for comedy companies much in our game, because they expected you to jump off the Brooklyn Bridge for seven and a half. From what I'd seen of Jack Warner, though, I liked him and decided to go in for some of his stuff.

A few days with the Warners convinced me of one thing: these two brothers knew what they were about. They may have been financiers, or what have you, in New York, but here they were producers. Dick Dickinson and I ran a Ford off a cliff into the water for them, and all Jack Warner said when he saw the "rushes" in the projection room was, "Lousy!" I didn't know whether he meant Dick and me, or what; but I guess he knew that when you're told to do a dive in a certain spot, that's the only place to go.

After our day's work was over Dick and I came back to our hangout, the Fox Studio. While having a little dinner, Dick took exception to some remarks made by Chick Stall, a property man, and invited him outside. I've never seen so much blood in my life, and I've seen some! Dick is a contortionist, and Stall a husky wrestler. They rolled all over the sidewalk; but this contortionism is a great art. Try it! It seems that you can wrap arms and legs in different directions at the same time. While the poor wrestler

would be struggling for a hold, Dick would wind one leg around his neck and pound him on the head with the other. My travels have taught me to be a flier, wing-walker, high diver, race driver, and what not; but I'd certainly like to be a contortionist!

A few days after we did this minor stunt for Warner Brothers we all had a party at the home of Pauly Malvern. Among the guests was one named Burgess. His line of work was much the same as Locklear's and mine: climbing the wings of airplanes, jumping from one plane to the other, and the like. Burgess had agreed to hang by his arms from a wing skid of a plane, also to do other minor stunts for Slim Summerville, and he was telling me how he intended to accomplish his job. More or less casually, I looked over his heavy-set body and mentally noted the fact that he weighed about fifty pounds too much for quick, nimble walking on wings. However, I listened.

On the day set for the stunt I stopped to watch it. The thing was not difficult; I would not have considered it even a pastime. But Burgess got beyond his strength. After twice letting himself out at full arm's length he found it impossible to regain the slight bamboo support. He held on as long as he could, but not quite long enough. His strength gone, and muscles crystallized, there was but one thing to do. He jumped. But it was a pity that he had to fall on the high-tension wires. His body was a crisp, and I knew then how I would have looked if the firemen had not got that net under those wires when they did.

XI

AMONG OTHER THINGS—LOCKLEAR, A BROKEN FOOT, AND A GIRL

OMAR LOCKLEAR was working for Fox, starring in a series of five-reel melodramas. Omar was the first person in the United States to change from one airplane to another, and he reaped the reward of his daring. It so happened that we had crossed paths several times in the Middle West when both of us were playing the fairs.

At that time, too, Ruth Law also was pushing her way in the little old Curtiss, accompanied by Barney Oldfield.

"Lock" and I had much to talk over when we came together in Hollywood, and we were glad to see each other again. Lock had with him his pilot, "Skeets" Elliot, who was as clever on the stick as they make them.

The pair were landing their ships behind the studio in an open space that borders Sunset Boulevard, but their regular field was Rogers Airport on Wilshire. Although the field was but a thousand feet long, "Shorty," the second pilot, and Skeets took off with Locklear on the wing. By the time they reached the end of the field Locklear was climbing the ladder on the landing carriage of Skeets's ship. That was the most sensational change I have ever witnessed.

Lock was very successful, but I thought now that something seemed wrong with the biggest dare-devil the air has ever known. He seemed very unhappy, and seldom smiled as he used to do in the old days. I was told, too, that even on parties in Hollywood, or at cafés, he would get morbid or cynical, and insist on going off at once to the aviation field. Skeets and Shorty would always accompany him there, and Locklear's chief stunt was to go up in one ship, coming down in another.

To make this change from plane to plane at any time of day is not the safest thing in the world; and at night—I just can't imagine doing it for fun. Locklear would seem relieved afterward, however, and would again be more or less the gay fellow we once knew.

While Locklear was starring I was doubling Louise Lovely for stunts, directed by George Hill, and as usual during this period was obliged to tackle more fire work. No particular danger was encountered, except that during the middle of one night's work the City of Venice was reported in flames. Instantly we dashed to the beach, and there were cameras set up to record the event. Hill had me racing through more burning buildings and streets than I ever knew existed. One in particular was warm! Just as I ran from the doorway the wall collapsed and killed two firemen.

By this time life was getting to be somewhat of a strain. Not that I worried as to what would become of me. I didn't give a damn. As I do now, I did then; I figured out my stunts long before doing them, and seldom missed. But we all miss sometimes. The great difference between the

lives of people in the outside world and this hell of ours is that when we make a mistake in a stunt our mistakes are irreparable. There are no erasers in our pencils. A mistake to us is a blot of blood. The dye is so permanent that the stain is everlasting. God is our only eraser—and He just rubs us off as part of His daily business.

However, there is one satisfaction. The pleasure is yours. We like to see people enjoy good pictures, and take great pride in furnishing thrills for the millions Out Beyond.

But *do* pictures furnish thrills? I usually go to see the films in which I or any of the clan have worked, just to learn how the public appreciates our stunting. When, for instance, a picture came out called *The Queen of Sheba*, starring Betty Blythe, I was eager to get the reaction of the people, not only to the film itself, but also to the stunts.

Words cannot describe my feelings when one lady reached over to another and said quite audibly, "They're certainly getting clever now! Wasn't that a beautiful fake?" The audience had just witnessed a net fall which broke the pelvic bone of a stunt man.

After this little experience I decided that those who made and patronized motion pictures had put us properly in our places. We were absolutely unimportant to the films. If we failed there was always the herd of amateurs left to kill off; those who came from all over the world, ready to risk anything just to get onto the screen. The stars and directors were right not to associate with us. After all, we were the most useless things in the whole game: ignorant, brainless, foolhardy.

One poor fellow I felt heartily sorry for about this time. He had been a stunt man for years, specializing in high dives. He couldn't have been more than forty years old, but he looked at least sixty. The only name we knew for him was Fritz, and even his friends called him by no other, though since early days he had been the ace of the Sennett lot. Earning good money, he saved part of it and bought for himself and his family a little home. He and his wife were close on middle age. They'd begun preparing for the time a few years hence when they could quit the game which gave a living but robbed them of all peace of mind.

Then Tragedy walked, and trod them down. Fritz did not miss the tank, but when he hit the cold water the shock to his nervous system was so great that he became completely paralyzed.

Even now, you may still see him slowly ambling down the street. The old smile is still there, and he has a cheery "How do?" for everyone on his way home to the little old wife. Thanks to the kindness of William Fox, who liked him and hated to see him go under, Fritz holds a comfortable if obscure and unimportant position as door-keeper.

It may sound queer, but it doesn't take much to injure a man when diving from an altitude of a hundred feet or over. Long before Slim Summerville and Bobby Dunn were teamed by Fox to make two-reel comedies, Bobby was a high diver. His ladder rose well into the sky, and when on top of it the tank below looked about the size of a thimble. Being a professional, this stunt he had to do seemed nothing to him, but, despite many net dives and

the like that I've made, I am sure that I couldn't do that one. When a child I saw one of these divers miss—strike the edge. Perhaps that is one reason why I didn't envy Bobby his job.

Before each dive he would carefully test the tank and see that the water was clear. But one day after his inspection and while he was climbing the ladder someone lighted a cigarette, and carelessly threw the match into the tank. It was just a tiny match stick, but when Dunn hit the thing it might well have been a knife. It ripped one eye completely open, destroying the sight forever.

Yet the loss of a mere eye hasn't stopped Bobby from diving. Since that accident I saw him jump from the top of the Bryson Apartments, a building one hundred and twenty-five feet high, into a mortar box. Of course the box, which was about eight feet long and four wide, had a false bottom. The water was four feet deep.

When Bobby leaped from the top I was sure that it would be his last dive. He was not headed for the box at all, but while in the air he wriggled and twisted toward his goal, so that in spite of my presentiment he hit perfectly. Believe it or not, the boy didn't even get his back wet, so quick were his movements.

Others are not always so fortunate, however, as Bobby was. The accident to his eye was due to a bit of unthinking carelessness on the part of an outsider, and was not his fault at all. Bobby himself was one of the clever and therefore the lucky ones. Professional stunt men, in order to live any considerable length of time and not get maimed, must first and above everything else *know their stuff*. You

can't do high dives if you don't know how. I would not attempt anything sensational with a horse, since I know little or nothing about stunt riding. The next most important qualification for a stunt man, after learning his work, is nerve—or the lack of it. And last, though far from least of all, is youth. Old bones and bad judgment among stunt men fill the hospitals and morgues.

If I were a producer I would interview personally every stunt man I hired, and those unfit should not be allowed to perform. It would be a humanitarian act to refuse those who are bound to be injured.

Arthur Seitz was a good example of a man not fitted by nature for the job he wanted. He was ungraceful, and had not the carriage or quickness of action needed when managing the body in the air. He also lacked a sense of balance. True, he had done a number of chases in comedies, and had successfully made a few small leaps, but they were all minor affairs. When he had engaged to do a stunt he worried, despite our efforts to cheer him up. The poor fellow was getting along in life, well toward the mesozoic stage, in which a man instinctively becomes cautious and inclined to settle down.

Regardless of these conditions, which he knew as well as we did, he took a contract to jump from a second-story window into a huge dry-goods box. This box could not have been more than six feet square and four deep. Yet a second-story window is a long way up if you hit wrong.

I watched poor Seitz as he stood on the sill, nervous and impatient, as a man of his age was likely to be in such a situation. I thought of the time when I had done a six-

story dive into a fire net with a cigarette in my mouth. Bernard Durning never quite got over the fact that I was still smoking it as I walked from the canvas. But I was young enough to be Seitz's son.

This particular jump was one of those which we all discounted; but at that we were there as usual to see how others executed their stuff.

As soon as the word was given to jump, it almost seemed as though he must have shut his eyes, so inaccurately had he picked the spot to land. He didn't hit the box, and he didn't miss it, but finished astraddle of the sharp one-inch boards. What a terrible accident from a minor stunt! It split him apart, up to his entrails. Hideously hurt, he half sat and half reclined where he had fallen, and unfortunately was fully conscious. Someone would have done the man a real favor in shooting him. I know this because, though I've never met with that kind of an accident, in some of mine the pain must have approached his.

The poor fellow's groans were inhuman. They sounded like the yells of some wild animal caught in a forest fire, about to be consumed. I'll never forget years ago hearing the screams of about twenty horses which were burning to death in a stable. Their cries of agony were human and this man's were animal-like.

And yet he lived! He'll always be a cripple, and they say that his sewerage system is transparent now, that he has to wear a lot of glass tubing; an existence which does not appeal to me. I hope if I ever get it, I'll get it so completely that they'll only have to shovel dirt over the spot and rope it off until the sun shines. However, I have found

that most people are like Seitz. They may say they'd rather die than be hurt beyond mending; but when it comes to the great big show-down the majority wish to live under any circumstances and hate to die. It is only the men in our game, or other games of the same sort, who sincerely prefer death to life as physical wrecks.

At the time of Seitz's accident I was working in stock at the Fox Studios with the old Al St. John Company. Al was (and is) a natural-born equilibrist. The way he could run a bicycle was nobody's business! Backward, forward, on his head!

I took him up in a ship one day and gave him the controls. Within five minutes he was piloting like an old hand. He told me that he had been with the game more or less since I started, and that he had made parachute jumps from kite balloons when he was afraid to stay with them and afraid to jump.

After about forty-five minutes he was ready for landings, and just about that time he decided that he would like to walk wings. I had nothing to say about it. We were in the air. I was at the controls. What can you do when your student suddenly decides that the seat is too small?

That started Al to walking wings, and I guess that in the few weeks before the company found it out and persuaded him to stop he walked as much atmosphere as anyone had ever walked. His favorite pastime was to fly over Beverly Hills, seek out Fatty Arbuckle's house, and carry on a conversation, comedian to comedian. This suddenly ended after a flight of prolonged duration during which we were forced to scrape the palm trees bordering the

streets. Upon landing we were escorted back to the little city by a squadron of motorcycle police.

After we got out on bail we all adjourned to St. John's home, where we held a stag party, three men and four women—the fourth woman being the stag. Al was a very generous host, and like all stars was incrustated with the usual motion-picture barnacles. I think that by the time dinner was served the party included some twenty-two guests. The stag party was ruined.

Days passed like minutes, and we stunt men used to find ourselves in a job, then out of one. But my contract with St. John lasted longer than most. When it ended I took on an engagement to double for the handsome hero of a Fazenda picture, and for this session we all adjourned to the waterfront at San Pedro.

I, doubling for the hero, was to jump onto the rail of a speed boat as it passed the dock. This thing sounded easy, but already I had learned that there are two reasons why directors and production managers make a stunt sound so "easy." The first is that it's really hard and they think you sap enough to take their word. The second, and paramount, reason is that they intend to give you as little for the job as possible. It behooves the wise stunt man, therefore, to boost his price up to twice the sum he expects to get, then cut to his own satisfaction and that of the main office.

This special stunt I speak of, however, really should have been easy. The wharf was about fifteen feet above sea level during the time of tide when we intended to work.

The speed boat was to pass within ten feet of the piles, and I was to jump at the director's command.

It was the boat's rate of speed that made the thing impossible, for going as it did, instead of coming within ten feet it couldn't pass nearer the dock than twenty-two feet. This made quite a difference in our calculations!

I could not jump that distance, but I could make a running dive for the rail. To do this required perfect timing, otherwise I would miss and be thrown into the water, dangerously near the propeller.

Twice I let the boat pass, making false starts to test my judgment. Then I gave my director the signal and the camera started to grind.

I did make a faultless leap. The distance wasn't too much; but had it been just six inches more I should have missed. As it was, I hit with such force against the anchor on the side of the boat that I broke all the bones in my left foot. And that wasn't all! The camera man ran out of film and failed to get the shot, which meant a retake. With my foot still numb and almost useless, I had to do the stunt over again. The bang that old foot got on the second successful jump didn't make me feel exactly like going to a dance, and the worst of it was that it would do no good to have the broken bones set that night. I was scheduled to make a fifty-foot dive from a bridge in Hollenbeck Park the next morning. That dive was nothing much—nothing much more than misery, with my foot swollen until only a giant's shoe could have been pulled on. I lost no time after the stunt was over in going to Drs. Dickey and Cass for medical treatment.

That turned out to be the luckiest visit I ever made to their emergency hospital. They set the bones, splintered the foot, and gave me two crutches to use. I hobbled away very unhappily. Now, I said to myself, I'd be out of the game (according to the doctors) for at least four weeks. A discount for good behavior and for my physical fitness might cut that in half, but I'd hardly be strong enough for any good stunts, although I might try to play around with them. Thus my thoughts as I crutched down the street, my head bent over to accommodate the pads under my shoulders. And then——

"Oh! you're hurt!" exclaimed the voice of a girl.

"Gout," I corrected before looking up.

"I'm—I'm so sorry!" went on the voice. "I often remember that brilliant fire dive I saw you do. May I help you to your car—or—may I drive it for you?"

Before me stood the girl with the innocent face—Georgie Smith, the girl I had wanted to meet!

"Why, I'd be delighted. It would be rather hard for me to manage alone," I said, trying to hide my happiness, and to put on a weary, hospital-patient air.

The girl drove me home, and on the way we talked of motion pictures, of her folks and mine, of the climate, growth of the city, real estate, her home town, mine, the traffic, light wines and beers. Finally the weather. Finally—nothing. We had been parked outside my place for an hour when we discovered that she had no way to get home—so I drove her home. Before I left her I had an engagement for the next evening.

It was now dark, and as I had had no dinner I decided to

go to the café on the Fox lot, our old hangout. The place was almost deserted and looked gloomy, but on the strength of that very fortunate meeting with Georgie Smith I had a good appetite, and ordered a T-bone rare with the usual hash-brown.

The Fates decree peculiar things, I mused, awaiting my order. Rather wonderful that just as I crutched out of the hospital She should happen along! An impossible coincidence it would have seemed, but there's no such word as "impossible" to Destiny. Those same old Fates hadn't been so mean to me after all! For years the Long Black Finger had pointed away from me when the Big Law called out for another stunt man.

I had had only two loves in my life: a very small and innocent affair before the war, then my ten days' leave spent with little Thérèse in Paris. Now it looked as if the Fates meant to give me a real Romance.

While I was thus ruminating a camera man on Locklear's picture came in and sat down near me. Between mouthfuls of the food just brought I told him of my slight accident, though nothing about Miss Smith.

Neither of us noticed Locklear enter, but when we did catch sight of him it was simultaneously, and the camera man shook his head.

"Lock's been acting queer lately," he mumbled to me.

"Working too hard," I said. "Too much of it. It's funny he didn't speak to us. We're here all alone . . ."

Locklear was leaning against the marble counter, staring fixedly into the mirror behind it. A chocolate soda stood

untouched before him. Then suddenly he seemed to recognize our presence. Turning round he asked:

"Coming to the field to-night?"

"Why no, I'm not," answered the camera man. "I have to work on some double exposures for the picture here at the studio."

"Better come out," said Locklear.

"But Lock, I'll catch hell if I don't get my work done. Anything exceptional out at the field?"

"Well," mused the king of stunt men, "if you don't come out you may miss the best shot in the picture." Without another word or look at us he walked to the door. We noticed that he'd left his soda untouched.

Some hours later I was still thinking over that short conversation. It was peculiar. Locklear's words sounded as if he had a presentiment. I'd heard others talk that way. I wondered what he might have meant, then tried to forget the whole incident. But it stuck in my head. Finally in disgust I threw down the book I was reading and put on my overclothes.

From my house to the field was approximately six miles and I had been ordered by the doctors to keep quiet. So I started out slowly. Yet the more I thought the faster I travelled. Soon I had only half a mile more to go. The drone of a motor could be heard clearly in the sky. Huge sunlight arcs were playing about the silhouetted figure of Locklear, five thousand feet above them.

Suddenly, as I looked, the wings of the ship gave forth a flame. There were phosphorous flares to make it appear as if the ship were burning. It was a clever stunt, and up

to that time not often done. I got out of my car and watched. Locklear went into the prettiest spin I have ever witnessed, with those tongues of flame streaming far back and into the heavens. One, two, three thousand feet he fell. He was now but a bare thousand up.

"Bring it out!" I said to myself as if I spoke to Locklear. But the spin kept on. "Bring it out—bring it out! For God's sake, Lock, quick! BRING IT OUT!!"

But he went on falling. Now it was almost too late to save himself. I started to run—my hands were wet with sweat. "Out—quick!" I stumbled and fell flat on my face. At the same time I heard the ungodly crash that only those who have witnessed a tailspin into the ground can understand.

When I got to my feet again the sky was covered with a red illumination. For miles around one could see. The ship had fallen into the pool of an oil well. It was all on fire. Locklear and his pilot Skeets had joined another squadron.

I got drunk that night.

XII

“BURRP!” THE HERO SAID

DREAMS! Nightmares! Locklear! Fire! Unbelievable pain! Horrible faces! Locklear! What I went through that night was a menace to sanity. I drifted into sleep only to hear and see that friend of mine being shot suddenly into hell. How much more vivid this death of dreams than death in actuality!

Again and again I heard that crash into the ground. I saw the terrific impact, the fire. Then I seemed to suffocate once more in that thick silence following the crash, when I had stumbled in the road. But now in dreams the flames were larger, fiercer. They were so close to me that my face felt burning, blistering. And in the centre of that crazy setting Locklear's features would rise and form in the flickering shadows of the flame. Ghastly and terror-stricken, he would cry to heaven through the darkness. Slowly, mechanically, his mouth would close, then open. The air would be rent with a harsh, agonized scream. Long drawn out, it would be terrifying, and I would answer. The vibrations of my voice as it rose to reach him seemed to shake the stars in their orbits.

At last I would start awake at sound of my own shouts

“BURRP!” THE HERO

to Locklear: “Bring it out! For God’s sake, bring it out!”

The nightmare dreams broke only to form again. Perhaps my sanity was saved by the pictures that came into my mind as I wakened.

The black square of ceiling in my room at Hollywood was a screen upon which the years of my childhood in the prairie home near the Canadian border passed like a film. A strange psychological puzzle, that the peaceful days of my early youth should alternate with the horrors of nightmare! But for the moments they were with me they calmed my brain.

One scene was as clear as it had been in reality, long ago: the northern lights kindled in the extreme cold of winter reaching up from dark depths of their circle in the North, spreading over the sky, and shooting their varied colors far into the south. To me as a child this had been an exhibition given by the Great Unknown Power, and I felt that Power behind it now, as I had felt it when I would slip out of my second-story window into the snow to stare over the black waste of whiteness while everyone else slept; to hear the wolves, the prairie foxes, the coyotes.

Here in bed in Hollywood I lay and wondered why the fire that burned Locklear’s ship lighted in my brain those northern fires of long ago. I feared I was going the way of all stunt men; for all who fail to be killed half expect to go insane. Never had any death affected me in such a way, not even that of Sylvester, the first friend I had seen die. But when the morning light of southern California chased away the little buzzards of the devil that had been picking at my brain, I felt more or less normal once more. I record

SQUADRON OF DEATH

offerings of that night only to show those outside why stunt men have to learn, in self-defense, to be hard-boiled.

I decided, when I'd had a cold shower and gulped down a little breakfast, that, broken foot and all, the best medicine for me would be a new stunt. I was going to call up Billy Wellman, Durning's assistant, when my 'phone sounded. I had secured my stunt all right!

I agreed to do as I was asked. By way of preparation I removed the splints from my foot and bound the broken bones so tightly with adhesive tape that circulation was practically stopped. It was only so that I could get into a shoe; but when I had pulled the shoe on I was surprised to see how little I limped. The one real trouble was that with every step I took I could feel the bones grind against each other. Of course I was doing an unwise thing from a physical point of view, but from a mental view perhaps I was right.

My knowledge of broken bones—which was plenty—told me that cartilage doesn't begin to form for about ten days after a break; so it would be necessary after this coming stunt to have my foot reset. Luckily I had, and still have, a doctor friend always ready to be called upon in such emergencies, independent of those furnished by the studio. Clarence M. Movius is his name. We had roomed together at the fraternity house when both of us were students at the University of Minnesota. Thinking of him, I felt confident that I shouldn't have to lose my job because of my foot, though I was being a bit imprudent. Anyhow, I went to the studio, reported, and the nature

of the stunt involved was explained to me. An imitation of a submarine had been built on the location of the studio tank set, and was to all appearances very realistic.

Good thing it was water stuff, I thought. It's easier to swim and dive with a broken foot than to walk.

The entire submarine had been waterproofed so that the electricians might place lights within the hull of the fake. A bell, which in this case was another waterproof container, was set about thirty feet from the torpedo tube. Within this the camera men and their equipment were to shoot the stunt.

What I was expected to do seemed simple. I had only to lie flat on my stomach within the torpedo tube, arms outstretched, while air was forced into the tube. When the container had a sufficient amount per square inch pressure to shoot me out into the tank some twenty feet, an automatic release would be touched, and the stunt would be on.

For this the only precaution I needed to take would be to have stoppers for the nose and ears. The director gave me these, the tank was hastily filled, and the troupe assembled.

Looking back now I can see no reason why a “dummy” instead of a “double” could not have been used with the same success. But on further analysis I can still get the producer's point of view. It would cost just as much to make the dummy as it would to hire the double, and in all other respects the two things are one and the same.

The tank was filled. I climbed into the conning tower,

which had been built extra high so that it might remain out of the water. Final instructions were given to me for no reason at all, and I crawled into the tube.

From then on I was the dummy. I had nothing to do but to wait. After they closed the trap behind me I was in utter darkness, in more ways than one. Dimly I could hear voices outside the tube, giving orders or frantically passing them on.

Then came the first burst of air. It was as if somebody had hit me hard blows all over at the same instant. I was glad that I had found exceptionally good ear stops and that I'd closed my nose with a strong pin, something in the nature of a double-spring clothespin. At the last moment I had also placed a pressure arrangement over my mouth, just in case I might not be able to keep the air from forcing my lips inward, thus allowing air to enter and burst my lungs.

Phew! came another burst of air! I felt as though some strange magician were squashing me down to half size. I knew then what the inside of a lemon experiences in a squeezer!

About this time it became imperative for me to breathe. I ventured to release the tension of my jaws. *Burrrp!* No sooner had I the thought than the air thought too. It forced itself down into my lungs. Again I increased the tension, even as the agony of holding my breath increased. The seconds were seeming long, a bad sign in such a case. Before they would pass into the past, as I counted them mentally, they seemed to stay in the present, dancing

up and down in front of my eyes, doing a couple of flops, then fading slowly away in a sneak.

Burrrp! Thinking too much, I had taken on more air. Why the hell didn't those goofs release me?

But on the deck a little comedy was being enacted.

THE DIRECTOR (scratching his head): “Something seems wrong.”

The assistant looks up at him from his low camp chair and yawns. He stretches his arms, then places his chin thoughtfully in a cupped hand.

THE DIRECTOR (with certain conviction): “Something must be wrong!”

ASSISTANT (head nodding involuntarily as the heat of the sun overcomes his loss of sleep): “P'raps you're right.”

The director's face suddenly beams with great brilliance. It beams with all the wisdom of Cæsar and the power of Napoleon. He rises slowly from the chair, and stands majestically, a sight for smaller men to behold. His every movement is being watched by an awed and terror-stricken troupe. He crashes his hand cruelly against his chest, his face revealing the intensity of his emotions.

“There *is* something wrong!”

Now back to the slave in the torpedo tube, who *burrrps* incoherently, “Sixes and eights.”

DIRECTOR: “There's a man in the tube!”

ASSISTANT, correctly: “No sir—a double.”

DOUBLE: “*Burrrp!*”

The director, the assistant, and the double beg for assistance.

A little man approaches, his cowardly pose a strange

contrast to the dignity of the director. He is the property man.

"Sir, the pressure has jammed both openings. But with a blowtorch we can soon burn a hole in the tube and release the pressure."

Frantically they all rush for blowtorches and assemble at the end of the tube as the only torch on the lot is rushed to the set. A loud hiss of air escapes the tank. Then the hinges are cut and the double removed. He is helped to his feet, and staggers drunkenly. Then he removes the mouth-piece. He looks them all over dazedly and sags to his knees. Registering deep disdain, he turns to the director as if about to speak. Everybody is silent. The moment is filled with drama. Breathlessly they wait for a statement from the double. It comes.

"Burrp!"

"Fire him!" from the director. "Nobody can give me the razzberry."

XIII

BEASTS OF THE CIRCUS AND STUNTING SKY HIGH

I DID not see Georgie Smith that night nor for many nights after. I learned in a roundabout way that the director of a picture for which I had done some stunts was making it difficult for me to get Miss Smith at home. Her line was always busy or she was "out." But at that time I didn't care much. I was so busy that I couldn't even find a few minutes to write home letters. In spite of my broken foot I was managing to do a few stunts. However, I didn't indulge in anything where fast foot action or balance was required until I was practically well again.

Then I was called for a stunt new to me. The picture was entitled *The Eleventh Hour*—a mystery melodrama. Bernard Durning was directing, so naturally after my work for him in *The Fast Mail* I was asked to join the troupe.

The first stunt wanted had to do with lions. Several times previously I had scraped acquaintance with these animals, but this stunt with them seemed rather difficult to me. A circular cage about fifteen feet in diameter and the same in height had been built of iron bars. The top

was roofed with two-inch boards. In the centre of this roof was a trapdoor, which could be sprung at will.

The story reads that a band of criminals captures the hero; but he, being a movie hero, escapes some fifty of the gang, and they chase him through the chief villain's House of Torture. Being pressed by his pursuers in the picture (and by his creditors out of pictures), he takes to the top of the lions' den. Whereupon the head villain smiles maliciously, presses any old button that happens to be strung around, and the poor hero is tumbled onto the lions through the trapdoor.

Before I got up on the trap I asked Charlie Gay and his fifteen lines if they were all tame. Charlie said Yes. Now Charlie has the only lion farm in America. In it he breeds, raises, and trains lions. I should say that he has two hundred at least in his "jungle" at El Monte.

He did qualify his statements, I must admit, by saying that he wasn't sure what these Kings of the Beasts would do in a motion-picture studio, when they saw something being thrown to them from above. Hearing this, I suggested that we try out another dummy before I went in. This he agreed to do, so I opened the trap and threw in the likeness of a man.

Well, you should have seen those lions go for that bunch of straw and plaster! Before it hit the floor about five out of the fifteen had it. And I had to remember that it was straw, and I meat. Once lions get the smell of hot blood they realize quite quickly that it's different from their usual diet of horse flesh.

Naturally I became a little dubious.

But I got on the roof again, and set myself ready for the spring of the trap. When they opened the door, however, and I started to fall, I knew that I hadn't used any too good judgment. Some of the lions started too. Others crouched into corners, waiting until they could more accurately gauge their leap. I thought they were the wise ones, so when I hit I made a jump for the bars, and with two leaps was up at the trap once more. Even before I got through it, one lion had torn my shirt and ripped a finger, but luckily I had four others to wiggle! I like lions—they're so nice and gentle.

Bengal tigers and leopards, though, are not favorites with me. I had to double Grace Darmond, Philo McCullough, and Jack Richardson on a serial which Warners were making, and had a running acquaintance with most of the animals of the Al G. Barnes Circus, which we used for the picture.

The woman in charge of the leopards kept assuring me that "leopards are as tame as cats when you know them"; so when her pets were in their cages that night I thought I'd get friendly. I didn't like to have them crouch in the back of their cages every time I passed and take a running jump at me. That made me nervous. So I got a hunk of meat and ventured close enough to shove it under the food board at the bottom of the iron bars. But the nearest leopard never looked at the meat. He just reached out one paw, grabbed me between the belt and the collar button and drew me right up to the cage. At that, he'd hooked me only with one claw, but we compromised. I gave him my coat and vest.

The next day, when the sweet pets were all turned loose on the stage (on one of which a jungle set was built) a husky leopard sprang from a tree when the trainer's back was turned and helped himself to her ear. Kind, gentle little pussy cats!

The trainer of the alligators put on the same act for me, vowing that his tropical charmers were tame and toothless. Whenever I got near to them, however, they didn't exactly blink their eyes with glee. They hissed "plenty," showing their interiors as far down as their tails, also a set of fangs to be proud of. I was further impressed by the trainer's statement when I noticed that he had only half a hand.

All of which contradictory knowledge made me happy because I had to wrestle with the leading reptilian, and finally drop into the jungle pool or watering hole.

The trainer showed me how to grasp an alligator properly. Approach it from behind slowly, then grab it and wrap your legs around its belly. After this, slide your hands quickly along the reptile's head to the end of the long snout, grasping the jaws. Then you have so much leverage that it is impossible for the brute to open its mouth. This proved to be not nearly so difficult as it sounded.

One other thing, too, I learned about alligators at this time. When you tickle them on their stomachs it hypnotizes them. For which reason I'm glad that I'm human!

All the animals on this particular picture were under the control of Curly Stecker. He had been trainer for a long time at Universal, so was well qualified for the job. He could make most of those beasts do anything he wished.

But one of them was a natural enemy: a chimpanzee. It had the nasty habit (every time Curly turned his back) of hitting him with one of its long paws as hard as it could. Curly stood this as long as he thought wise, and then of course he punished the offender.

That did not improve matters, however. Instead of wallowing the trainer the chimpanzee took to biting him, and Curly in a rage fetched a pair of pliers and pulled its teeth out.

Curly had one other enemy among his charges. This was Charlie, the gigantic pachyderm at Universal. It seems that Charlie had once gone on a rampage out at the "U," and Curly had taken a shot at him. A bullet hit the big old elephant on the forehead and of course did nothing to him except to make him mad. But—elephants never forget.

Four or five years later Charlie was working for First National. Curly was also engaged on the lot but with a different company. Charlie caught sight of him from a distance, however, as Curly was passing the set and started for him. I don't think Curly knew, until the elephant was within a few feet of him, that he was the quarry wanted. When he did realize what was up it was too late. Charlie wrapped his powerful trunk around his ex-trainer's waist and threw him to the ground. But this was only the beginning. Next, the elephant plumped down on his huge knees and started to knead Stecker into the ground. The only thing that saved the trainer from instant death was the fact that he had been thrown so close to a huge stone that it was impossible for Charlie to get at all of him.

Instantly the elephant's own trainer ran to the spot

and beat the beast on the bottom of one of its hind feet, which made it cry like a baby. Which is a good trick to remember if an elephant ever gets you down.

Curly's ribs were pretty well smashed before he was released, however, and he had some bad internal injuries, from which he later died.

As time went on Charlie grew too mean and killed rather too many people; so they decided to get rid of him. They could find but one safe way to do this, and that was to hang the huge beast from a big steam derrick.

For my last stunt with the Al G. Barnes Circus, Philo McCullough and I had to be in a canoe out in the middle of the tropical pool. Then they turned the hippopotamus in. It was supposed to enter the water and play around, at last coming fairly close to us. When it opened its wide mouth, that was to be our cue. We would then head for the shore.

A hippo is wise. Even with its short legs it can run as fast as a horse. Not that this one did so. It ambled slowly along, sweating its usual amount of blood. Then it entered the water and sank. We knew that sometimes these living submarines stay under for hours, so Philo and I just sat there and waited. But not for long! All of a sudden we felt the boat rise under us. We were tossed into the air, and when we landed we were swimming. It was a close race, but we won. And if you think we can't climb fences ask Philo.

When the hippo had hunted us from his domain nobody could get him out. Ruth, the elephant, was pressed into service, but the hippo knew what he wanted and chased Ruth away squealing. If you ever saw a mad animal it was

when they drained the whole pool off that hippopotamus!

Directly from the Warner Brothers serial I returned to Fox, to do a stunt for Tom Mix, and this time I was back in my former profession, that of acrobatics in the air. The picture for which they wished the stunt was called *Sky High*, directed by Lynn Reynolds. It was up to me to leave the cockpit of the ship and slide down a twenty-foot knotted rope.

Of course this does not sound difficult, and to many people probably wouldn't be so. But I knew rope ladders well. I knew that the ordinary ladder is hard enough to work on unless you have every little detail of the business in your head. For instance, it is much easier to climb a ladder facing opposite the direction in which you are going. This can be understood when you consider that with the speed you make you are blown against the ladder. Whereas if you work from the other side you are being blown away from it. Another secret of rope-ladder work is to find time and positions for repose. If your arms get tired it is a simple matter to rest, hanging by your knees.

But just a plain knotted rope gives you none of these advantages. At all times both the arms and the legs are under a severe strain. If you don't believe this climb up and down a twenty-foot rope and then add to your other troubles the fact that you must combat an eighty-mile wind force. Also that there's the fuselage to climb up or get down to!

For these reasons I didn't consider this stunt particularly easy. Furthermore, it was Friday the thirteenth when this was due to take place, and on our way to the

field in the studio car a black cat crossed our path. That such a combination of omens should present themselves at once was startling, even if I were not superstitious. So imagine my mental state when on changing a five-dollar bill on the field I got two two-dollar bills in return. After this, just to make all things right, I lit the third cigarette on a match and then went up to do the stunt.

"Bud" Creeth was the pilot, and one of the very finest. He had been in pursuit ships during the war, had been decorated, and had never left the game since. He was known as a steady, conservative flier. I had been acquainted with him for some time, and on other jobs (similar but not so difficult) I had always asked for him as pilot.

When we were about five hundred feet from the ground I got Creeth's nod. This was the signal that he was ready for me to get out, that we were now in position for the cameras on the ground. I left the seat and climbed over the side. The "wash" from the propeller was strong, equal to a gale of cyclonic velocity.

Slowly I made my way to the end of the rope, where I was whipped and whirled in all directions by the wind. Every time Bud banked the rope would swing, and I noticed another detail which I'd failed to take into consideration: that banking when on a rope is different from banking when on a rope ladder. There you don't feel the reaction to centrifugal force as much, because the rungs of the ladder give you some stability.

At last we got the O. K. signal from the ground and I climbed back. But it wasn't easy climbing against wind and height on such an unstable thing as a rope.

We landed, reloaded the cameras, and immediately took off again. This time another ship had the cameras on it, to catch the same shot from the air.

Once more I repeated my performance. I believe no one realizes what it is to do those things one after the other. That shot was not to the satisfaction of the camera man and so, rather worn and tired, I finally accepted the signal to repeat the stunt. Each time I slipped farther down the rope I felt that I was making a graver mistake. But eventually I reached the bottom, where according to programme I went through the motions of waving to someone on the ground. Each time I waved it, the arm acted like a weather vane, and whirled me like a top! But this was no place to get dizzy. Vertigo would be as fatal here as it would be while flying through fog in the night.

The view one obtains from beneath a ship is a peculiar one at any time, with only the belly and bottom of the wings to look up to, and certain death to look down upon. We were up to five thousand feet. The little patchwork quilt that represented fields and cities beneath was beautiful, but not particularly pleasant for me to contemplate. I was not tied nor wired, had no rung on which to place a foot and give my arms a chance to regain fast-ebbing strength. Still no signal came from the camera man. Soon—soon I should have to do my best to climb back.

Again I looked down. We were flying over mountains; Mount Lowe with its observatory was almost directly below us. A fine sight ordinarily, but I was in no mood to admire them.

Apparently the camera man had forgotten that he was

to give me a signal, or how could he expect any man to have such endurance? This was my third trip up and down that ladder and I'd been performing this last time for at least twelve minutes. Just try to climb up and down a rope inside a gymnasium for such a length of time, and see what it feels like.

I had almost gone the limit of my strength, so regardless of camera man, picture, or orders, I started to climb back to the cockpit.

It was slow work! I labored. Each time I took a new grip and pulled myself up it became more evident that I would have to fight hard for my life.

I glanced over to the camera ship to see if the man there was still grinding. He was! But he now seemed to realize that I was in trouble and intended to record the whole incident if I should fail. I smiled—grimly. Well, why shouldn't he? It was all in his day's work!

I got to the bottom of the fuselage and there the full effect of the wind blast struck me. I hadn't an even chance to make it, being so tired. My muscles ached intolerably; were becoming numb. My shoulders seemed about to break. I was now just crawling inch by inch through that propeller stream. The rope was close to the fuselage, making it difficult to obtain new holdings; but after a struggle I got my hands on the edge of the cockpit—the seat I had left those few minutes before—minutes which seemed so long. It was then that the final disappointment came. The holster at my waist caught in the linen on the under side of the fuselage. Every time I tried to lift my body toward

the seat it stopped me. I looked up at the leather-covered side of the pit, so near yet so hopelessly far away!

Then I looked down. The distant earth was inviting—restful. To one suffering as I was the fall with death at the end held no such terror as I had dreamed. Thus had Burgess died, and I believed that it was with no regret or fear. He must have felt much as I did at that moment: longing to be relieved at any cost from the anguish of utter exhaustion. As runners in marathons fall and lie weakly on the ground, so Burgess must have given up. Too tired and weak to care, I let myself out to my armpits. So, held on with the fingers of one hand, I would make just one last desperate effort. With the free hand I unbuckled the holster and it flew away in the wind. Then both hands mechanically sought the cockpit.

But Creeth saw—and understood. Desperately he tried to control and to help at the same time, but he had to keep a level keel, as one little bump would knock me loose. I shook my head in negation.

Bud was more than six feet tall, and well built. From out of nowhere he appeared over the seat. I knew then that he must be controlling partially with his knees. We were climbing almost to a stalling point, as with one hand Bud pulled me up far enough to get my foot in the foothold at the bottom of the fuselage. Then I was able to make the pit, where I sat weakly for a few moments. I was without a thought, and if Bud thought anything he never said anything to anybody about it as long as we knew each other.

XIV

SOMETIMES THEY MISS

SHORTLY after this adventure I bought two airplanes of my own ; and Tom Mix gave me a T. M. Scout for a Christmas present. From that time on I was equipped to perform all manner of stunts, including my changes from plane to plane, wing-walking, parachute-jumping, and the rest.

I didn't confine my work to any particular line. I still engaged for high dives and went in for any hazard that was well paid and interesting ; but my being definitely in aviation again and an owner of ships gave me more prestige. This was owing to the fact that aviation is a field of its own, apart from motion pictures. Film producers merely borrow aviation for the glorification of their pictures.

It was through my possession of these ships that the well-known Dick Curwood and I became great friends. We had met in the studio and had been on several pictures together. I could take him up and let him crawl, walk, and run on the wings of my plane. His life had been so varied and exciting that he could tell good yarns. I grew to like him immensely.

Till I met Dick I'd had an impression that my own past wasn't exactly a blank page, but when I listened to tales of Curwood's wild adventures I felt an infant. He had

known tragedy. Dick had married a girl he loved, when he was very young. Then his wife had died, leaving him with two babies to support and bring up. That was enough to wipe the old smile off his face, especially as he hadn't a cent saved. He worried a bit, and maybe worry helped him to have appendicitis. Anyhow he had it all right, and an operation to follow. The children were with his mother and sister, yet he had their keep and education on his mind, so he decided to search for gold in Alaska.

How to get there was the question!

He was still weak, just out of the hospital, when he started to work his way to the Klondike. Only a man with the bulldog determination shown by Dick's set, square jaws could have endured the hardships he went through. He engaged himself as a cook, a waiter, a bell hop; but those were the easy jobs. Nothing was too disagreeable, too difficult, if it helped him heap up a few more dollars toward buying his outfit for the Far North.

Well, he got his equipment together, and started off for the desolate wastes where the chances of striking a vein of gold were said to be best. He had a partner with him, but the partner died when both were beyond the zone of civilization. Curwood had to battle on alone, struggling toward his goal; and the hero of a movie bravely enduring his hardships would have been rewarded by a fortune. Being only a "true to life" hero, his efforts were crowned with failure, or partial failure. Instead of the cool million he'd set out to make, when at last he gave up and cashed in the gold he had panned and dug, his fortune amounted to no more than four thousand dollars.

Still, he had the same old ambition: to educate his children, to send them to college, so something new had to be planned. Dick dragged his way back into the United States, and gambled all his savings on the purchase of a free balloon. With this he intended to give exhibitions, only to face disappointment again. The work was tedious and paid little; so when a big movie corporation hired him for a balloon picture the poor fellow was happy.

As usual, he rejoiced too soon. He had drawn only two weeks' salary when again the dogs of ill luck caught up with him. A strong wind arose just as the last hydrogen needed to fill the great envelope to capacity had been injected. Despite all efforts to save it the balloon broke away and shot skyward. Off it sailed seaward, and was last seen halfway to Honolulu.

It was a bad anticlimax after owning a balloon to go back to parachute jumps, changing from airplane to airplane and doing general stunt work, but Dick, like the majority of us, was not his own master. Thus he and I were thrown a good deal together. After all he had gone through I was glad that our joint stunts generally turned out to be successes.

Along came *The Eleventh Hour*, the film in which I made my happy escape from the lions. Dick Curwood and I had to supply the thrills for the picture, and the steel mills at Torrence were chosen as the scene for part of the action.

I'd never been through such a place before, and seeing the workers with their blackened faces, stripped to the waist, sweating among huge pots of molten metal and

gigantic vats of steaming water, I said to myself, "Give me the life of a stunt man!" It was just about as safe, and much cleaner.

One of the steel workers told me that, owing to the dust and terrific heat, the men were inclined to tuberculosis. The tissues were burned from their lungs! And as for accidents, when a man fell into a vat of red-hot metal they buried him, metal and all. That sounded pretty ghastly; but it seems that a man melts much sooner than metal does, so it would be useless trying to get his body out. This was sweet hearing for Dick and me, as our orders kept us playing around and above those big vats of bubbling iron.

Our first stunt at Torrence, however, wasn't apparently very difficult, though it held one or two unpleasant possibilities.

We had to scale a wall of the structure, some fifty feet high, and when we'd reached the top the next duty was to catch one of the big travelling cranes that transported loads of metal. Two feet below the crane, and parallel to the wall which we had to climb, were six highly charged live wires; and anybody who had enough English to read the warning words DANGER! 22,500 VOLTS on the walls at intervals could hardly fail to be impressed. Dick and I fully realized what might happen to us if we didn't handle our bodies with care.

Catching the crane ought to have been easy for men who thought little of doing changes in the air, etc., but who wouldn't rather push up a few daisies than be shocked to death?

The track on which the crane ran was just a little more than an inch in width. That meant nimble footwork or we would fall on those wires directly below. I had to follow Dick until we got above a small shop office, in fact, approximately thirty feet above it. This office was on an elevated cement floor about halfway between us and the crane, and its roof was made of glass.

Swinging directly over the glass roof, though thirty feet above, I was supposed to jump, break through the glass, and land underneath. Dick had then to jump shortly after I had made my leap.

He and I managed to scale the high wall (with cameras cranking of course), and to pass over the high-tension wires safely and to catch the crane. Then with Dick after me I ran to the centre of the moving metal carrier. Everything was nicely timed. I arrived just as the crane started to travel over the office, and jumped instantly so that Dick would have time to follow.

It's rather a peculiar sensation to hit a level surface which looks solid, though you know you have got to go right through it. I hit, shattered the whole roof, and carried down with me a rain of glass and broken frames. Strange to say, I did not get a cut! I hardly stopped to draw breath before crawling out of the way. Then I watched Curwood as he prepared to leap.

One of the toughest things about this game (I won't call it a "profession") is having to stand by helplessly and see a friend get hurt. Something mighty bad was due for Dick. I could see that before he jumped, but I could do nothing.

The hole I had made was waiting for him, and I knew he was aiming for it. But he stood there stiff-legged. His knees were locked, which meant certain injury. No one can land on cement from a height of thirty feet and take the shock with stiff knees, safely. A leap even of six inches, taken like this, can break your neck.

Dick jumped. And he jumped off balance—another error. When he hit it was with that crunching, shattering sound which only those who have seen fatal injuries of that kind recognize with a shudder. Just too late it occurred to me that I might break the fall by flinging my body under his as he landed. My one consolation was, later, that I couldn't have saved him from some damage, and that if I had got beneath him in time the company might have thrown the whole blame on me. Even Dick himself might have thought it would have helped if I'd let him alone.

As it was, Dick was done for, after his hard life of struggle and adventure. He lay there on a bed of broken glass, groaning, begging someone to kill him, to put him out of his pain. Almost at once the doctor was on hand, and gave him an injection. Five minutes later he was still. You could hardly hear him breathe. He looked like a dead man, but he was not dead. He was destined—doomed, I might say—to live with a broken back.

I didn't feel inclined for further stunts that night, but several were on my list. I had to be knocked under the chin, fall backward from a height of twenty-five feet, and land in two feet of water. Later I had to pass over the boiling vats of steel, and when I felt their terrific heat I got a peculiar thrill. One misstep, one error in judgment, and

down I'd go into the fire. Certainly a quick death! I could have made a bet that I wouldn't have time to let out one yap before I began to melt, as the steel workers did sometimes! Not all my previous experiences could keep me from thinking a bit, not only of poor Dick and many others who had been hurt or killed in the game, but of myself, too, and how, though I'd never refused a single stunt, here was I alive and well!

So *The Eleventh Hour* ended as a dozen other pictures had ended for me, without even a slight injury.

Either your number is up or it isn't, and of course mine had to emerge from the shuffle once in a while. A Fox film was to be done from a Rex Beach story, with George Archinbeau directing. In the cast were Evelyn Brent, Tom Santchi, and a good many other well-known people. The reason I got the offer was because in my years of stunt work at Hollywood (I'd had five years by this time) I had built up a reputation which some men might envy. I seldom missed a stunt; and very few times was it necessary to make retakes of anything I did. Consequently, though I asked high pay, studios considered it economical to engage me for anything that was in my line.

Mr. Ryan, the casting director, called me into his office and told me what I would have to do.

It seemed that a dance-hall set had been erected on Stage 1. It was supposed to be of the sort popular in the wilds of Alaska during the mad stampede of gold-rush days, and probably would have looked more or less familiar to Dick Curwood. A balcony, perhaps twenty feet above the main floor, was to be partitioned into booths.

And in these booths would be girls of the type which decorated dance halls in those days.

Being a place of revelry, liquor was supposed to be served, and in the course of a brawl some drunken sourdough was to throw a lighted match on the flimsy ballet dress of a dancer. Instantly the tulle, or whatever it was, would flare up, and the girl, wreathed in fire, would rush from the private table to the railing of the balcony. She would pause for a second, then desperately leap from the balcony onto the floor about twenty feet below. At this the hero, tearing off his coat, would wrap it around her, smothering the flames.

I, being of medium height, could easily double for the girl in medium and long shots. It wasn't the doubling that was difficult; it was the stunt. But it wasn't a new one to me. I had done the same thing before in a Dustin Farnum picture, so the thought of danger didn't worry me till later.

There was a difference of detail in this film, though, which was more serious than it seemed at first glance. In the Farnum picture I had doubled a man's part and had been dressed in a dinner suit. In the present one I would represent a girl in a fluffy ballet costume. That was a complication; and when I'd reflected upon it a little I didn't like the idea of the stunt. I foresaw that at best I would come out of it with a few minor burns, and besides, if I had a complex it was fire. My mother's great adventure with me as a baby in her arms, in a burning house, had probably left some impression in my subconsciousness. However, I needed the money to support the airplanes I

had accumulated with the rest of my equipment nearly as much as poor Curwood had needed it for the support of his children. Besides, there was my pride in never refusing a stunt, no matter how dangerous. But as I said, I didn't like it. And as the time drew near I developed one of those strange "hunches" or presentiments which come to me in my work. They seldom or never deceive me, and I began to feel that this was one of the times when I could not escape.

Still, there it *was*! I'd accepted the job, and it had to be done. I put on the ballet clothes mechanically, and as I looked my healthy body over, slipping into the tights and flimsy dress of the double, I wondered what the condition of that body would be a few minutes later.

I went to the set. Cameras were placed. The drama of the scene was pitched as usual. No one cared much about me. I was only the double for the stunt, and no one guessed or would have been interested in my mental reaction. If I hadn't wanted to do the thing why had I undertaken to do it?

The director gave me his last instructions, and I received them with outer calmness; but my heart beat fast as they soaked my clothing with gasoline and alcohol. At times when I had no presentiment there was no increase in the heartbeats while I prepared for a stunt, no matter how difficult. Doctors have always tested me before my latest stunts, for if my heart showed irregularity I should know I was no longer fit for the game.

I was ready. "Cameras!" The word clicked from the mouth of the director.

"Set him on fire!"

That was a bad moment. I rather think I prayed.

The property boy threw a lighted match at me, keeping a respectful distance himself, and instantly I became a human torch. Flames leaped eighteen feet above my head. Something had gone wrong. This wasn't according to plan.

Not that I was thinking about that, then. I wasn't thinking at all. I was feeling. I had never dreamed of such agony. I was burning to death, the worst death man or animal can suffer. The terrific heat scorched my lungs. It seared my flesh, bit into my muscles. Even through my anguish of pain the smell of my own burnt flesh sickened me. I can smell it again now, and feel the horror, as I write. If I live to be old I can never forget.

"Help! My God, I'm burning to death!" I cried. Frantically I leaped down the stairs, landing so hard that I broke a two-by-four in the floor below. Then I was up again, half mad and yet fully conscious, running round and round in a circle to prevent the flames from entering my lungs. All the while I remembered to keep my face covered with my arms, though the flames licked my armpits. I don't know how I did that. Perhaps it was instinct. Or maybe I was recalling unconsciously some faces I'd seen as a result of war.

"For God's sake, put me out! Put out the fire!" I begged.

Just then the assistant director stepped in and tripped me up. It was he who saved my life. Gordon Hollingshead. To him I owe what is left of me.

He wrapped me in blankets, and fought desperately

with the flames. But it was hard work—almost more than he could do. First the flames would shoot out near my head, then from my feet. For more than two minutes, which seemed to me like years, I burned and burned. Then I lapsed into unconsciousness, but not for long.

When I woke to my misery again a few seconds later it was to realize that my body was a charred, blackened mass. From head to waist all my skin was burned off. I rubbed one of my charred arms over my chest and bits of the flesh dropped away from my arm. Clothes, skin, flesh were all one indistinguishable mass of blackened cinders. The thought of myself as I now was nauseated me; but just to prove that I wasn't down and out, I rose to my elbow, then staggered to my feet, and with the help of the ever-present doctor walked to my dressing room.

Another stunt finished! I had been paid for it, and I had paid—according to the doctor—with just seven hundred and eighty-six square inches of skin. "Now you know," he said to me, "exactly what it is to burn to death. You couldn't have suffered more had you gone through death itself by fire."

And after all that gasoline had done to me the doctor washed me off with it! The agony of this treatment sent me wild—crazy. Gasoline on raw flesh! But at last I was given an injection; and then I "went for a ride"—a ride to the hospital.

I thought I had said my last good-bye to stunts, as well as to the world. Not that I cared much. Thanks to Dr. Dickey that I am among those present, but with a third

of my body burned to a crisp, in some places half an inch deep, I didn't see how I could ever be well and fit to face life again. Queer how Nature helps doctors, though. I'll never quit the game unless I'm maimed. And the public must have its thrills.

XV

THE "MASTER"

MEN in my game have their favorite hospital, just as those in quieter professions have their favorite tailors.

Now, as I was rushed to the refuge I most often patronized, I mused semi-consciously. "Well, what if I have missed one stunt after bringing off all the rest in a six months' stretch? Anyhow, I'll get a good rest."

I was received like an old friend by the staff, who knew as much about my anatomy as most people know about their best friends' faces, and for a week I did get that rest—as good a one as pain would let me take. At the end of that time I was told I might have my visiting hours, and people did their best to show I hadn't been forgotten.

I was pretty well tired out after a day of kind tributes when I was told that a "gentleman wished to see me on a matter of importance."

"He's got a basket of about four dozen red roses in his hand," said my nurse.

That sounded funny. Gentlemen don't usually shower roses on stunt men. I thought of all the girls I knew. Was any one of them likely to send a father, brother, or boy friend on such an errand?

"What does the gentleman look like?" I asked.

"He looks a little like an Oriental," said the nurse. "But he's dressed in European clothes."

The description didn't fit any of my surmises, but it intrigued me. I decided that, after all, I wasn't too tired to see one more visitor before closing hours.

The nurse, evidently as curious as I was, brought "the gentleman" in. She might have lingered; but that Chinese Buddha in tailored tweeds made it evident that nothing more exciting than "How do you do?" would pass his thin, yellowish lips until we were left alone.

As I gave him the once-over I judged him to be of Chinese extraction, with his close-shaven head, his pointed chin, and narrow, brooding eyes. He had good features, though slightly wrinkled, but I didn't place him as a Chinese gentleman. Neither did he look like a servant, but as he bowed and deposited the basket of roses on my bedside table he said:

"My masteh admiah Misteh Glace, so sendee li'l flowehs."

"He's a friend of mine?" I queried.

"Yes, velly much good fliend, but Misteh Glace not know him."

"Then why in—— I mean why does he send me flowers?" I asked.

"He admiah Misteh Glace' big blaveness, like I tell you," the man went on. "He see you on Bloadway jump flum high building and do many, many otheh things. He enjoy velly much watch Misteh Glace. He follow Misteh Glace do one—what you call big stunt—afteh anotheh. So he send wishes' fo' Misteh Glace be soon well, with this basket of

li'l' flowehs. And those not all. He give me letteh hand Misteh Glace, open when I gone, but please, when Misteh Glace alone."

All this began to have a fishy sound to me, and I didn't like it much. But the man left me no time to argue. He laid a large sealed envelope on the bed near my hand, and was out of the room with the door shut behind him before I could get out a question.

Not so much because I was alone, as the mysterious "masteh" wished, as because I was curious, I didn't waste a minute in opening the envelope.

What I expected to find inside the thing I hardly knew, but thought it likely to be something idiotic in the way of praise from some silly "fan."

He seemed to have used a lot of paper anyhow, I thought, as I drew forth a packet so fat it tore the envelope as it came out. But the gray sheet of paper that matched was only a wrapping, and I could hardly believe my eyes when I saw what it contained. There was no letter; not a word of writing. The gray paper had been folded around several government notes. The upper one was for a hundred dollars. Staring and bewildered, I looked through the rest as I counted. There were ten in all, and each for a hundred dollars.

A good many strange things had happened to me between the time I took my first flight and the time when I had this last accident that brought me back to the hospital; but this seemed almost the strangest.

An Oriental "gentleman" sent by a "masteh" with a gift of red roses and a thousand dollars, and not a word

of explanation! I didn't know what to make of it at all.

Though I earned big sums of money, I spent what I got about as fast as it came in, and I could do very well with his donation. But I had no intention of putting this to use. I knew there must be something very queer about it, unless the donor was wrong in the head; but I decided not to take anyone into my confidence until the affair had developed, as it was pretty sure to do, in one way or the other.

I wondered what would be the "follow up" after this peculiar lead. But there was none. Ten days after the mysterious visit I was dismissed from the hospital, well enough to have my wounds dressed at home. I had fastened the envelope with the "grand" inside and put it among my other letters. At home it had been transferred to the back of a drawer where I kept handkerchiefs and collars. If it hadn't been for that envelope and what was in it I should have forgotten the whole incident in the many other, more important, things I had to think of.

I'd been at home only long enough to have the privilege of being left alone when one night the doorbell rang. There was only one person to answer, and that was myself. I hobbled to the door, and there stood a man. It was dark outside, and darkish in my hall, but I could see just well enough to be sure I was facing a stranger.

"Good-evening," he began in a pleasant, educated voice that sounded just a little foreign. "You don't know me, so I must introduce myself. But I hope you will let me have a few words with you alone. I have a very important business offer to make to you."

I reflected quickly that without much doubt he had already made sure as possible that I *was* alone. He might be a bootlegger soliciting a client, or even a hold-up artist, but as I possessed little worth taking I didn't hesitate more than a few seconds to invite him in.

I ushered my guest into the living room where I'd turned on the lights. Another Oriental, or anyhow with a dash of blood Mongolian or Caucasian! Instantly I associated him with my visitor in the hospital. I'd have been ready to bet that here was the "masteh." But I kept a poker face, and even when he laconically informed me of the fact in so many words I pretended not to understand what he meant. I wanted to make him talk while I asked questions or just listened.

"But perhaps you do understand," he said quietly, his black eyes and his black hair glistening in the light that fell over his square-jawed face. He might have been about forty, and he was dressed like a well-off business man in that everyday life of Los Angeles.

"A few weeks ago when you were in hospital I sent you a small gift," he reminded me. "It was in the hope of binding us together in future business associations. Also to prove that I put implicit trust in you. My word is as good as my bond, and I'm sure yours is."

"Oh!" I said. "So it was you who sent me those nice roses and—er——"

"A gray envelope."

"Containing?"

"One thousand dollars in hundred-dollar bills."

"We agree on that. The money is still in the envelope."

I've been wondering when I'd hear from the sender. I thought there sure must be some mistake."

"No mistake," said the "masteh." "The thousand was sent as a small sample of what you can earn in the work I've come here to-night to speak about."

"I'm under contract," I said. "I don't see how I could take up anything outside at present."

"When we have had a talk I think I can make you see that your professional engagements won't interfere with what I have to offer. Do you object to mentioning the sum you earn per year, Mr. Grace?"

I was tempted to tell him that it was none of his business what I earned, but my curiosity prevented an answer that might shut him up. "Oh, sometimes I have a good year," I replied evasively, "and sometimes one not so good."

"Do you total over twenty thousand in your good years?" he persisted.

"No."

"Well, then, you are being underpaid. With your darling you are worth many times twenty thousand a year, to the right people. I can see where in a few months you could become financially independent for life. How would you like, Mr. Grace, to make a fortune in a short time? Listen. I'll trust you in this, if you agree. The thousand is yours in any case. And *if you'll work under my orders for three nights* I'll put in your bank to your credit seventy-five thousand dollars."

"Good Lord!" I gasped. "What do you want me to do?"

The "masteh" smiled, not a good-natured smile. Still, it was a sort of smile. "Will you assure me of this: whether

we come to an agreement or not, am I speaking to you in confidence?"

I looked the man over for a minute without making up my mind what to answer, so he spoke again.

"I presume the agent I sent to see you at the hospital told you of my admiration for your work. I chose you for this offer on that account. Only an exceptionally experienced flier could undertake and carry out what I want."

"Oh, it's got something to do with flying?" I mumbled.

"It has a great deal to do with flying."

"Hm!" I said. "It doesn't sound—well, it doesn't sound straight to me."

"That depends on what you call 'straight.' Liquor is forbidden in this country. Do you never drink any?"

I had to grin at this.

"If you were over in Tia Juana and someone handed you a present of a diamond ring or a fine string of pearls for your best girl would you slip it in your pocket for her or would you declare it to the customs?"

"I hope I'd declare it," I said.

"But maybe you'd be tempted."

I shrugged my shoulders. "I guess I'm getting onto this," I said. "You want to hire me for a smuggling job. Is that it? It must be a big one, too, if you'd pay at the rate you just mentioned."

"It is big and I would pay at that rate. The United States government and I are the two powers who control the law of supply and demand in necessities and luxuries. They die—they worse than die—they suffer unspeakable torture without those necessities. It is cruel of the law to

make citizens of the United States suffer as no decent man would make a mad dog suffer. Now I've gone so far I'll explain further. The situation is this. I deal in the wholesale importation of nationally banned drugs. You can't prevent me from dealing in them. If you don't work with me someone else will. And you *can't* work against me. I'll tell you why not if you force me to do so. But as you can't stop me, why not put your conscience to sleep, if you're troubled with such a cancerous growth, and work for me? Morphine, opium, heroin, cocaine, are my merchandise. There are thousands, millions, who must have them or hell. I consider myself a benefactor by giving them what they want."

"You're some Samaritan!" I said.

He took it that I made this remark by way of a pleasant joke, and that he was getting around me.

"Our problem is getting the supplies in any quantity from Mexico into the United States. Never mind how we get it into Mexico. That's not your affair. Nor how we get our diamonds, a side line of ours that's very profitable and would help to swell your bank balance. Our base is approximately sixty miles distant from the border. Great quantities of—our merchandise can be collected in a few hours, or even less. The difficulty is transportation to Los Angeles. This is the only strategic entrance for our stuff into the United States. Our organization is powerful here, as you must realize by this time, and capture within our boundaries is hardly to be feared. You see why I called Los Angeles the one "strategic" entrance in the States from Mexico. The city is only one hundred and thirty miles

from the border. And by *airplane* the trip takes but a little more than an hour."

The man stopped and eyed me, but I was flabbergasted. I let him go on.

"With a large, fast airplane," he went on, in his soft, hypnotic voice, "operated by a competent pilot like yourself, success is sure. The craft I would give you would outmanœuvre any of those that patrol. It should make more than one hundred miles per hour fully loaded for a thousand-mile non-stop journey. This pilot would take off at dusk from any local field. He would fly directly out to sea for fifty miles and then turn south. By compass and watch he would know when he was safely within Mexican waters. Then he would head inland and alight. Within an hour he would be supplied with gas, oil, and his return load: twelve hundred pounds of cargo ten times as valuable as platinum. Again he would go out to sea, then make for Los Angeles. But—of course he wouldn't alight at any of the fields. At a secluded, pre-arranged landing place well-hidden automobiles would await his arrival. The pilot himself would not land, however; he would merely swoop close to the ground, pull a lever, and let the strong cases drop. His work finished, all he'd have to do would be to fly quietly back to his home field.

"Now, Mr. Grace, you have the proposition and the programme. You are the man we want in our organization. We're willing to go to any reasonable limit to attract you. As I said, you can go on with your ordinary work, and keep an engagement with us at the same time. The combine of which I am the head offers you, for each of the two first

successful trips, twenty thousand dollars. For the third successful trip, which means making delivery at a certain spot at a certain early hour of the morning, you will receive thirty-five thousand. This is the best 'get-rich-quick' opportunity that's ever likely to come your way. Without mishap you should collect within one month from now as much as you're likely ever to make just stunting around—and your money is safe for we put it in escrow for you."

"Do you mean to tell me," I almost gasped, "that you dare use the escrow departments for such a purpose?"

"Certainly. How otherwise should we be safeguarded?" the amazing personage replied. "When a man enters into a contract with our combine we let him choose a piece of property equal to the value of the agreement. Then we buy the property. If and when he fulfills his agreement with us, we turn it over to him. For instance, suppose you became associated with us. We will buy real estate of your selection worth seventy-five thousand dollars. After you've accomplished one successful trip it counts as if you'd made a twenty-thousand-dollar payment on the property. Do you see?"

I saw all right; and it would be a lie to say I wasn't tempted. Here was what seemed to me, at my age, a dazzling fortune. And it would be almost as easy for me to pick it up as it is for a boy to rob a bird's nest. The "masteht" had tried to make me believe, too, that it wouldn't be much wickeder than egg stealing. With what he offered I could do, while I was still young, all the unbelievable things my wildest dreams had pictured coming to me after half a lifetime of hard, grinding work.

For years I might stunt for screen producers, if I was lucky, and not accumulate any such sum. As for the risk, why, it didn't compare with the most ordinary dangers I ran six days out of the week! That, I saw, was the chief reason why this offer was being made to me. The "masteh" and his gang knew that personal hazards didn't count much in my life!

The man let me alone to think things over for a minute, and then got impatient.

"Come now, Mr. Grace, show your practical common sense. If you don't take this great chance another man will, depend on it. You'll *prevent* nothing by refusing—except the filling of your own pockets. Hundreds of men would snap at an offer of less money. They'd beg for it. But you are the man we want."

I did hesitate. I heard him repeating his words, "only supplying a demand; saving unfortunate people from torture." Then my thoughts jumped from that snug property in escrow to my father. Why, he himself had said to me, "Opportunity knocks only once at the door," and my father's maxims had always meant a great deal to me. But what would he say about *this* "opportunity"? Three trips, to unload in the United States about four thousand pounds of forbidden drugs and smuggled diamonds. The money the gang stood to make would total millions!

Perhaps it was seeing my father's honest face and fearing his voice as if he were in the room which made me jump up from my chair before I spoke. I walked straight to a desk where a gray envelope lay under a lot of loose stationery. I took out the envelope and handed it to the "masteh."

"Here," I said. "I guess this is my answer to your whole proposition. Count the money, will you?"

"You're a fool—a fool!" the man broke out in a burst of rage.

"You're right about that if about nothing else," I agreed. "Every stunt man is a fool. I'm only one more."

"And the biggest!" said the "masteh."

Instead of taking the envelope I held out he lighted a cigarette.

While I waited for him to put the cigarette in his mouth and throw away the match, suddenly I felt a small, round, unmistakable object press deep into the middle of my back. I didn't turn round—thought it might be a mistake to do so—or move in any direction, but I think I was too much surprised to be exactly frightened.

It hadn't occurred to me to lock the front door after letting in my visitor. As usual I'd left it on the latch, and as my back had been turned to the living-room entrance since the beginning of our talk, it had been easy for a confederate to tiptoe softly in. Probably he'd been in the room for some time, just awaiting a signal.

"Your friend didn't wait for an invitation, did he?" I said.

The "masteh," knowing it would be inconvenient for me to move just then, pulled an automatic from his own pocket. "Stick 'em up!" he gave the classic command.

I stuck them up, with the envelope still in my hand.

"Now, Mr. Grace, watch while I pay for your body," he said. He helped himself to the envelope, keeping me covered, and a nod from him released the pressure in my

back. The gentleman with the gun walked round to survey me from the front. My guesses had been wrong. It wasn't my hospital acquaintance but a stranger, and not so nice to look at as the messenger had been. This one's nose had been badly manhandled.

By the way he eyed me, however, it seemed as if we'd have at least a bowing acquaintance soon. The "masteh" eyed me also. In fact, he didn't remove his gaze from my face, even as he passed the gray envelope to his broken-nosed pet. I guessed at once that the "payment for my body" was being made, and the surmise was confirmed as Broken Nose was told to count the bills.

"Put them in your pocket," he directed. "Now, look this fool over so that you can't miss recognizing him under any circumstances. It will be your business to watch him after this. If he attempts to cause us trouble of any sort you are authorized by me to give him the works."

"Right," replied the other. "I get you."

The boss didn't think further words necessary in that direction. He addressed me. "And he'll 'get' you if you're not careful, Grace. Are you sure now you see what a bribe I can offer for your life in a town where I can buy or sell most men's for a hundred and fifty? Are you sure you don't wish to change your mind?"

"Sure," said I. And I was as sure as I'd ever been of anything in my life. Not only that, I was sure of another wish: to get even with these bums for this hold-up act if nothing else.

"You are crazy as well as a fool," he said. "Don't you realize now that if I choose I can *force* you to work for me?"

"I never heard," said I, "that even if you take a horse to water you can force him to drink."

"If you don't realize the truth you will later," he threatened, not in a blustering tone, but one that was soft and disgustingly gentle. Still staring at me, he gave a slight jerk of his head, and before I had time to move his henchman hit me just back of the ear. When I awoke they were gone.

I had had a few bumps already and one more didn't matter. But this one made me madder than all the rest, and I cursed myself for not having told my attorney about the mysterious gift in the gray envelope.

I had had just sense enough at the time to suspect something more or less criminal, but hadn't had any other motive for a more or less expensive legal chat, so hadn't even thought of putting the matter in a lawyer's hands. Had I done so, we might somehow have traced the criminals. As it was, he explained to me that it seemed as if I'd let the horse be stolen before the stable doors were shut. He took the matter very seriously and warned me that without doubt I was in danger.

Well, that didn't worry me much. All my lawyer could persuade me to do by way of safeguard was to telephone him twice every day. I was to tell him, not only how and where I was, what I meant to do, and so on, but whether I'd received any more threats. He thought it likely there would be some, or an attempt at deeds stranger than threats, for if I was being watched "they" would be sure to know I'd visited him.

Though the "masteH" had hidden his own identity from

me he had had to give away some details (such as the gang's plans, and the distance of their supply base over the Mexican border), and all his prudence in trying to engage me couldn't screen him completely. He would feel that he wasn't as safe as he might be.

"As long as he'll be feeling that way, you'd better feel the same," my attorney advised. And he wasn't wrong, because a week later another little thing happened.

I'd been having a hard day flying, and ten miles out of Los Angeles I got into my automobile headed for home. It was dusk, with sunset slowly streaked with crimson. I was just thinking that life was really an enjoyable adventure when—*bing!* a shot rang out.

My car was running along a lonely stretch of boulevard, and I jammed on the brakes.

A bullet had missed and the next mightn't. So I stopped the car and there was the man I expected—the gunman. He walked up and examined the radiator.

"Maybe you thought my shot went wide," he said coolly. "It didn't. See!"

The motometer was broken, glass and all. A bullet had passed directly through the centre. The gunman came to the side of the car, gun in hand. I was unarmed. "This is just to show you!" he barked. "Keep your trap tighter shut than you have done, Buddy; that's a straight tip. Attorneys may be good for some folks sometimes, but not for you *this* time. See? Now beat it and don't look back or you'll look into *hell*."

I beat it. But when I got home too late to catch my

lawyer at his office I called his house. He was in, and I went round to see him. He advised me to do no more telephoning for the present.

Next day I had cause to remember a warning of the "masteh's": "We can force you to join us," or words to that effect.

I drew one of my airplanes from its hangar at the aviation field, and after warming it up thoroughly and testing its various assembly, I climbed into the cockpit for a stunt that I was due to make.

I decided to fly over Hollywood first while gaining altitude, and when near my home field put the ship through its paces. I was soon above the heart of the town, and after circling a few times I started again fieldward. Hardly had I nosed the ship in that direction than I developed a miss. Then in quick succession the cylinders refused to fire. I was losing altitude, and knew that I should have to land.

There was but one hope of avoiding a serious mishap, and that was to land on a main thoroughfare. So I selected Wilshire Boulevard. Picking a spot clear of automobiles, I glided to a stop, though not without causing a sensation. A slight examination showed me that all of the points on my spark plugs had been sawed partly through.

The work had been done by no novice, that was sure. He had known that my motor would function perfectly until the heat had burned or bent the weakened points, causing a complete miss of the cylinders. Apparently no other parts had been tampered with. I had to hand it to that bird. I'd mixed up with some game!

My attorney wanted to have me guarded by detectives, but I wouldn't stand for that. Life wouldn't be worth living. Besides, what could they do?

I went on as if nothing had happened, and as time passed nothing more did happen! I'd begun to think that perhaps the gang had given me up as a bad job when one night about eleven o'clock I was starting out from home for a party, with a friend. My car was parked before the house, and to my disgust I saw that I had a flat tire. I immediately prepared to change it, and while I was getting the tools I heard a slight scuffling noise. My back had been turned to my friend just long enough for him to be seized by a couple of men.

I jumped for them, but a third man sprang from behind a tree. "Stick 'em up!" came the old familiar words. To cut a long story short, my friend and I, with gags in our mouths, were herded with less difficulty than we liked into a big touring car. We were being taken for a ride.

The public is fairly familiar with the routine of some excursions these days. I hardly need to say that there was no pleasant chat during this trip. It was one of those silent dramas, but I enlivened it for myself by a good deal of thinking, and I was pretty sure that my friend was occupying his mind in the same way.

We tore through the night, and it was only because I have a sense of direction that I wasn't completely confused. "Bound for Chinatown," I deduced.

Down a side street off Main we whisked. As we passed a dark two-story building the driver of the car gave three sharp blasts with the horn, and I caught the return signal:

a small, red electric bulb flashing twice. Chinese began to pour out of the houses, and I guessed, when we drove round the block, that the man at the wheel was simply marking time. He'd be back when enough of them were gathered to remove us without a fuss.

Two of the gang sat between my friend and me. I would have given all I had for a word with him, but even without it there was one thing I could count on. He had no connection with the affair, as the boss's spies must know, if they'd watched my movements as well as I imagined. They had brought him along only to keep him from giving an alarm too soon, and rather than kill unnecessarily, they'd release him when they could safely do so. I was the goat! Knowing this, I decided to take a chance for myself if I could get a break.

The quickness acquired in my stunt work helped me as nothing else could. As one of our gunmen leaned across to the other, I dived head first from the car. My shoulders hit the pavement, but there was no perceptible pause between that blow and the spring that brought me to my feet—running. As I turned a corner a bullet hit the bricks and rather served to increase my speed.

My friend reached my house not long after I did. He had been thrown out of the touring car.

I rather expected another attack from a new quarter, but none ever came. That was the end of my experience with that mob. As for the "maste," though my night "ride" was the last of him and his manoeuvres so far as I was concerned, many things have convinced me, and others, that he and his group still exist, still function, and

still operate or attempt to operate a drug ring which has for its scope the whole of our United States.

"The last of him so far as I was concerned" was as I said. But I happen to know that the big plan wasn't given up just because I refused to carry it out. There were others to rely on.

There was one whose name I won't mention. Whether his bribe was as big as the one offered to me I don't know. Maybe not, since his reputation for daring wasn't much better than that for his morals. Anyhow, he'd snapped up the bait. "They" bought him a good ship for the venture, a popular make of monoplane capable of making 125 m. p. h. He took it to Mexico and landed it there. But schemes will go wrong at times.

After the ship was loaded the Mexican government caught on (must have had a tip) and made a surprise visit just at the critical moment. The pilot contrived to escape, but the monoplane was captured. No doubt the gang would have preferred it the other way round.

They had to lose the ship, but they couldn't bear to let the Mexicans rejoice over it. Some members slipped past the guard, or greased their palms, removed the spark plugs, and put nitroglycerine into the cylinders. When the switch was turned on and the propeller began to revolve the ship was blown to pieces.

It interested me to get this news, but it would have interested me more had I not just at that time given myself something quite as absorbing to think of. The wounds left under my arms by the fire had webbed in healing. My

doctor said I would never again be able to lift my arms high over my head. I didn't like that prophecy, which, if it came true, would put me off the list of stunt men. So I stood before a mirror and cut the webs with a razor blade.

Now I can raise my arms as high as anyone.

XVI

AËRIAL STUNTING

DICK CURWOOD was in the hospital for three months, in a cast that covered a greater portion of his body. He certainly began to look as though he would not pull through. His cheeks were sunken and his eyes seemed set so far back in his head that they could hardly be seen.

However, once he was released from the cast he gained rapidly. But it had broken him financially. It is true that we get our hospital and funeral expenses. Also that we draw twenty dollars and eighty-three cents a week while injured. But how far would this go to support yourself and two children?—which was what Dick was doing. Moreover, when the insurance doctors released him altogether he was unfit for work. He was well as far as they were concerned, but not for the type of things which are pushed to us.

Then he received an offer to do one of the biggest stunts of his career, and he asked my help in getting the job. Really I had already applied for it—exploding an airplane in the air by placing dynamite in the front cockpit and in the gas tank. The price I had quoted for the thing was thirty-five hundred dollars. Dick told me his, which

was little more than half of that. So I promised him that I'd stick to the one I had made, thus sewing up the job for him.

He got it, and both of us were pleased. Still he was actually no pilot. I think that he had flown by himself very few times. But we fixed that up by getting him instruction and then a ship to use for a few hours.

Finally both the company and he were set for the flight, and so the entire troupe except Dick went to the location. He followed in the loggy old Standard J1 a couple of days later. Some of the equipment of the navy was used for camera work, including the F-5-L naval bombers.

Dick's ship was loaded with explosive, which was arranged so that after he pressed the button which ignited a fuse he would have ten seconds in which to leave the ship by parachute before the blast occurred. Previous experience in packing 'chutes came in handy now. This was once when the thing had to open as soon as he pulled the ring, yet he must delay the action long enough to let him fall clear of the débris from the ship.

All was in readiness. The ship was loaded with its deadly cargo, the motor tested, and the back pack carefully folded and slipped into its cover. And Dick, true to the heritage of all real stunt men, was the coolest one on the troupe.

Yet who would blame him if he were not? It takes guts—intestinal fortitude—to do some of these things. Imagine yourself actually getting into a ship, not being an expert pilot, to go into the air some twenty-five hundred feet. And when you get there you have to press that button. A slight little pressure on a small little button, but it means

so much. It means that if you don't jump immediately, if you don't clear the ship, if you don't keep from pulling the rip cord on the 'chute long enough, you'll be blown to atoms.

But he was cool. His immobile face was set for the job, but showed no fear, no emotion. As he crawled into the cockpit the huge bombing ships received a signal and took to the air. It was also a signal for Dick. His motor was warmed and revved up. Then the chocks were removed and he gave it the gun. He was off. And he was plenty anxious to get to the proper altitude and do his stuff. Why? With that load of death distributor in the front anyone would. Vibration or a rough bump might cause a short. Then there would be instantaneous explosion and fire, wings, motor, and a body all floating in space. That would not be good.

It took almost a full hour to get to the right height and position, but finally they were all flying in formation. Some camera ships above, others below. The wings of the big bombers wiggled their O. K. signal. Then came an answering wavering from the old Standard. Dick was ready. The cameras started to grind.

Evidently he had pressed the button, for he could be seen starting to crawl to the side of the ship for his dive. But he never got over. Without the slightest warning the entire ship blew to pieces. The explosions were premature. Either the fuses were too short or they had shorted. At any rate there was just the slightest fraction of time between that fatal press of the button and the white cloud. Sprays of burning gasoline and débris were thrown in all direc-

tions. Dick was in the midst of it. One of his first sensations was none at all. He was knocked out of the ship cleaner than the motor was. And he told me that the thing that woke him up was a piece of shattered wing that tapped him as it passed.

Anyway, when he thought that he and the débris had passed each other a sufficient number of times he finally gathered enough of his dizzy brains to pull the ring. The pilot 'chute immediately popped out, and the long string of parachute followed. Of course it was a great satisfaction to him to see the big parasol fill with air, but at the same time it was cause for consternation. In a dozen little places it was burning, where the gasoline had sprayed or fallen on it.

With his usual cool quick mind he realized that it was up to him to save himself. If this menace continued long he could not. When sufficient area of the silk burned he would drop faster than the ship had, and it was already at the bottom of the ocean.

Of course he could not climb up and blow out these fire patches, but he did the next best thing. He yanked the shroud lines on one side with all of his strength. This partially closed the 'chute, pulling it together at the bottom so that the air would not get in to fill it. After falling for a couple of hundred feet he let it fill again and looked up. Now there were but a few burning places. Again he repeated the process. Successful. A few minutes later he was struggling in the water, the stunt a success. It was a matter of seconds to get out of the harness, by which time the speed boats were there to pick him up.

Every time that I saw Dick after this he bemoaned the fact that they had burned holes in his best parachute.

Shortly after Dick did this extraordinary stunt I quit pictures temporarily. I was given a chance to rise in politics. That is, they wanted me to fly an embryo politician around and over the city, which was all right in one way and all wrong in another. All of the flying was to be done under a thousand feet.

When you're over the field and your motor quits this is all right, you know where you are. But when the OX5 pops and sputters when you're over a great city, where are you?

But I undertook the job. Partially for the money, but more because Bill Camp, the politician, was a friend of mine. We had his name spread on the sides and bottom of the fuselage and also under the wings. To attract the attention of the populace further huge police sirens were installed on either side of the motor. Then, gathering together some twenty thousand handbills, which were tied in packages of five thousand, and a policeman to throw them, we took to atmosphere.

I circled most of the congested district of the city several times, giving the officer of the law violent nods of assent that everything was set, and to break the cords binding the bundles. But he sat there as dumb as any mummy ever taken from Egypt. So finally I decided things must take the proper course. I banked, came up into a vertical, and then nosed earthward. How should I know that that policeman was scared before I did that stunt? Well,

he was, and when I went into that little unusual turn he just heaved everything that he had in his lap right into the air. Twenty thousand bills all tied together. Then he grabbed leather and hung on.

When I had fought off a couple of the bundles I was immediately terrified with the possible results.

Something of the nature had occurred to me years before, when doing stunts at a fair. My motors burned castor oil and in those days it was impossible to get it any place but drug stores. So I always had a supply of quart bottles in the front cockpit. Well, I went into a loop on this one exhibition, and the straps holding my tools and the bottles broke loose, right when I was on my back on the top of a loop. One hit me, but I ducked the rest. I landed immediately to see what damage had been done and was just viewing the probable spot when one farmer said to another, "You know, it's the gosh-all-hangedest thing you ever hear'n tell. I was standin' next onto the front wheel of Lizzie, just about to take a step, and somethin' whizzed past my straw hat. Can't say as how I felt it, but it passed, an' when I looked at the ground I'll be gol-durned if all I could see was a hole with oil coming out'n it!"

That was enough for me. I alternately paled and flushed as I thought how quickly that man might have taken a dose of castor oil.

So I was equally perturbed when this policeman threw everything to ten winds. And was not much relieved to see all the bundles plop right down in the centre of the city hall.

After this I decided that the councilman had to take

responsibility himself. So I made him fly with me. The next trip he wanted all of the dodgers dropped in the ball park while a game was on. Each one of the handbills had all of the reasons why he should be starred in the city council, and all were news to me. I just knew him personally, not politically. Anyway, we gathered another armful and started for the game.

It was a nice warm day and everyone's girl was there, because Mr. Wrigley lets the ladies in free. So the stands were pretty full. We circled a couple of times, getting about an inning of the game free, and then I got into position for the bombardment.

I gave the usual nod. He started cutting loose, and didn't quit until he had emptied the entire lot into the air. I could tell that they were going to be a direct hit and smiled with a little satisfaction over my good judgment. Then I banked around to watch them float in.

Which they did. All in one great cloud, covering the sky from home base to back fence. But it was just my luck to have the star of the game hit a high fly into that bunch of flutters, and I guess the poor guy in the outfield thought every piece was a baseball. Anyway, he caught the wrong one, and the last I saw as we headed for home was one grand rush for the umpire.

Well, on the way home I got to thinking over all of this foolishness and decided that politics was just as much of a game as my own. One minute you're up and the next you're down. To me this was a lot of horsing around.

So I came in to make a real conservative landing, when

bang! Someone sneaked up and caught my aileron. I really did see him, but pretended not to, because I had a clear right of way. However, if I hadn't given him a little room he might have cracked us both.

We have regulations now governing that sort of thing, but then we had no Department of Commerce, and it was up to us to stop such nuisances. I caught a good look at him as he passed. It was Hubert Kittle, one of the craziest fliers that ever held a stick, and it rather burned me up to see him laugh as he flew by. My injured left-wing control was too loose to do anything but fly straight, so I stayed up until I saw him land and taxi up to the line. Then I got back and glided in. I came closer and closer, stalling always as I got near his ship.

Just as it seemed inevitable that I should hit him I saw him jump out and try to pull the wing down so I could glide over. When but a short distance back of his standing ship, I gave full gun and nosed upward, slapping his top wing with my tail skid.

I cut and landed immediately, taxiing up and turning about so our wing tips almost touched. He was already out. I got out. I could see the hole I had worn in his upper section. We passed the casual "How-do-you-do's" and I walked to the office. He never bothered us in the air after that. But he did end up rather sensationally. He would lie on the floor and try to ricochet bullets from its glazed surface to his chinaware on the wall. Eventually he committed suicide.

Which is almost what I made Bob Rose do. Bob had

been working with Ruth Roland for some time when I contracted to do some aviation work in one of her thrillers to be directed by George Marshall.

I thought we had done everything that it was possible to do with an airplane, but when I got halfway through that serial I felt like quitting and going back for more instruction. George was easy on me, though, because he also had been an aviator in the war, so he didn't expect any more of me than he could have gotten in northern France.

One day Joe McKlusky came up to me in a friendly way and said: "Dick, my friend, how would you like to fly to-day?" and whenever he said that I knew that he and George had concocted some stunt.

But this time Bob was in on it. Bob had to hang to the last rung of a rope ladder while I dragged him through part of the Pacific Ocean. The cameras were to be set at the end of the breakwater.

A couple of hours later we were all set and Bob and I took off with our pet rope ladder.

Now Bob is cool and mathematical. I've never seen him do a single stunt except by mathematics. Not the kind you get in school, but the fine mathematics of a calculating mind. And when I showed him the big whitecaps swelling ten or twelve feet high, out where we were to perform, he agreed that it was not the safest thing in the world to do. There was a high wind, too, that made it bad, because at the angle of the set-up we could not go against it, but necessarily with it. This increased our speed considerably. And to add to our discomfort the navy started target

practice on our course. To them a picture or a stunt man or two meant nothing at all. The air was rocky and plenty rough from the concussions and air disturbances caused by the big guns.

But we started. At the proper spot Bob let the rope down, and waited until I got into position. I swooped down and soon was skimming along about twenty-five feet from the water. My speed was excessive, travelling with the wind. Then with all the adverse conditions we hit one of those bumps caused by the navy smoke blowers. I suddenly knew that I was about to dip a stunt man into the water. I was undecided whether I was going in or not. The nose of my ship shot seaward and—in went Bob. It was almost sure to be his last stunt, for we did not even have a safety boat standing by.

I yanked back on the controls and gave the motor full gun. Slowly it responded, and kept me from taking a ducking also.

For a couple of hundred feet I kept bumping the rope ladder in the water before I could get lift enough finally to clear the big rollers. Quickly I turned around. If I could locate Bob in those churning waters I'd be willing to duck the ship in, in a last attempt to keep him from drowning. He was nowhere to be seen—evidently had been knocked unconscious in the first slap against the waves, and had gone under. I signalled shoreward, but of course they could not guess what I meant. How cold and uninviting that water looked! How deadly and funeral-like. Knowing that water is almost as hard as the earth when struck at great speed or from a great height, I could hope

that he had been killed by the first impact. It would be easier than swallowing the ocean.

I could not see the rope ladder, because it was directly below the ship. But I knew that it was there. I could feel it turn and twist in the wind. And now that Bob was gone I'd have to land with it dangling.

Then a hand appeared over the side of the wing, followed by another—then a bleeding face. The clothes were torn from his body. It was Bob! I gave a little exclamation of joy and throttled the motor so that he might get up more easily.

From the cockpit I noticed that the skin of his legs was stripped in little ribbons as if someone had taken a razor blade and mathematically laid open and torn the skin at intervals—and he stopped to drag the rope ladder up and over the wing before he attempted to make the cockpit.

XVII

OFF OF WOMEN

A COUPLE of times before I had sworn off women. A few things happened in a row to make me think I was right. I fell in love. That was the biggest one of all. It may be all right for some people, but it drives a stunt man flip-flop dizzy. And what I mean is this: If you're a bookkeeper you can write an "I love you" instead of a figure eight, but if you're a stunt man and just about to do a six-story jump and look up and see the moon you're liable to make a misstep.

I met Georgie Smith again, and it had the same effect as catnip on a one-year-old kitten. All I could do was think of calling on her, all I could see was her face when I started a stunt. She was working on one set with me when I was supposed to jump over a balcony and do a somersault to the water below. I got back and prepared for the leap, and just as I was about to clear the railing I saw her smiling countenance. Well, I smiled at the wrong time. I did just enough turn to land on my chin and push all my teeth through my upper lip.

And if that wasn't enough, I was doing a stunt for Fox the day following, in which I had to wire a half-size bed

to the top of an airplane and then have one of my pilots play around in the air with it—me being the goof who nightwalks and runs.

Well, I ran back and forth a few times, which is not easy on the top wing with nothing to hold on to. And when you strike a bump you are left in midair for a few seconds, hoping that the ship won't travel clear out from under you before you start coming down.

About the tenth time I ran and jumped over the bed I thought of Georgie, and I took the prettiest nose dive you ever heard of. Usually this means that you go digging daisies, but with my good luck and lack of sense it meant that I rolled right back on the pilot. I didn't stop to beg his pardon. Anyway, when I got to the cockpit I found that I had cut the left side of my nose almost through with the sharp edge of a piece of piano wire.

I was through with the women.

Moreover, the next day after this I tried to land on the top of one of the big stages at Fox studio and almost made it. But just when I was going to sit down I felt a funny ripping sound in back of me and instantly knew something was wrong. So I went back to the field. When I came down and examined the fuselage I found that there were two neat holes clear through the ship. Somebody had taken a shot at me!

Well, I went back to the studio and found that a woman with a .30-.30 had been popping at me because she thought I had been scaring her chickens too much. So I decided that I wouldn't be shot for any woman and I'd give up Georgie Smith.

But after all she was a nice girl. Beautiful to look at, and a perfectly innocent heart. Of course, she had been out with a couple of directors since I had seen her, but I knew that she had not so much as kissed them. There are a few nice girls in Hollywood, and I knew perfectly well that she was one of them. Everyone said so—even the directors. That convinced me.

No one can deliberately break engagements, especially with such a nice girl. It just wouldn't be right. So I didn't. I couldn't have if I'd wanted to—and I didn't want to.

So I went over to her house, and she and I got her father out of the kitchen (ordinarily called the Hollywood cellar) and we got "poppa" feeling very good. His health hadn't been exceptional for the last few years. He'd been mixed up in some new Middle Western politics. But he was feeling pretty good by the time he climbed the imaginary stairs to the living room, and when Georgie and I went out to talk on the porch swing "poppa" went out on the divan. Georgie is smart as well as good-looking, and I admire a woman of brains, looks, and purity. Everybody does. And they all agreed with me then.

When I went home that night I didn't care whether I stunted any more or not. With a girl like Georgie one would be content to live on love. I knew then that I'd drive a truck or a milk wagon for her, although I couldn't think of the milk wagon because that would keep me out all night, and think of that poor little innocent thing being alone all evening!

However, it was late that night and I had to get up early. I had to do a change from one airplane to the other

without a rope ladder. It didn't annoy me much because I had done it for fun more than once.

I was feeling perfectly normal when I took off my clothes, had my quick shower, and jumped into bed. And then a most unusual thing happened.

I know I had been asleep. But of a sudden I awoke and was sitting upright in bed. At first I couldn't imagine what it was all about, couldn't place myself. And then over the foot of the bed I saw something which made my muscles freeze. It was Sylvester! The Sylvester who had been in my class. He who had been killed flying formation. And he was looking at me with that same hardness, yet that unbelievable kindness, which I had noticed as I last saw him. Every line in his face, including the wrinkled forehead and deeply creased smile lines, were there; those big pores in his cheeks, the peculiarly shaped chin. I knew that this could be no dream.

And he raised his arm in a warning and pointed the finger at me. I thought I heard a whisper, thought he gave me a warning for the stunt on the morrow. And then it was gone.

For a few minutes I lay there silently. Was or wasn't it a dream? I had a cigarette and thought some more. Well, anyway I decided one thing. I was through with Georgie Smith. This dream, if it was one, was probably on account of women. From now on I'd be a model for celibacy. The next morning I felt awful. Even a shower did me no good. As I never eat breakfast I couldn't eat any on that morning, which I knew to be a bad sign.

So I went to the field. We prepared for the stunt. That is, got a camera mounted on one ship and warmed up my two which were involved in the transfer. We took off. And I wasn't in the spirit. I got to thinking that if there was a heaven for me beyond, it would be filled with motion picture companies wanting changes from airplane to airplane, or crack-ups. It was all professional to me now. No thrill. No sensation. No elation.

I got out on the lower wing and ran out to the last strut. Then I climbed it and stood waiting on the top panel, just about at the cabane posts. I was braced—ready.

The other ships came pouting along. The experienced pilot was handling it well. Gradually he drew closer until I could just about reach the wing skid. It was directly above now and we were ready. The only tense moment in a change.

This one never came. At that moment we hit a terrific bump. The wing of the top ship dipped down and that of the lower plane up. And there I was, or wasn't I? I am not an accordion, but I did make a great bumper. Something hit me and I went down. I don't even remember if the two ships separated. I didn't care. Somebody pulled a shade over the sun and the light went out.

The next thing I remember was coming in to land. The top of the wing was slippery with blood, and I was caught in one of the cabane posts. I looked at the blood. It must be mine, but from where? It did not take long to find out. There was a neat hole in the back of my head.

It reminded me of the hole a dentist leaves when he pulls out a molar. The illusion struck me as funny and I laughed. The more I thought of it the funnier it got, and I laughed and laughed and laughed. I was still laughing when they took me to a hospital.

After that I thought about Sylvester.

XVIII

THAT THE FILMS MAY CARRY ON

I MADE five hundred dollars out of politics. Bill Camp came out to the aviation field and said that I had never given him a thrill in the air. I admitted that possibility, because I'm through thrilling unless it's called for in my business. But he kept insisting that I couldn't, so I asked him if he had anything to back his judgment with. He drew out five one-hundred-dollar bills, and then of course I couldn't back out.

I put up a check that wasn't any good and got into one of my ships. We got up to five hundred feet and I looked over my spot. I'd picked it to try sometime, anyway. Two oil derricks about a hundred feet apart had a steel cable connecting them. This cable at its lowest sagging point was a good thirty-five feet from the ground.

I banked into the wind and went into a dive. When a couple of hundred feet from the ground Camp looked back but could not see me. The windshield covered me perfectly. At a hundred he was tugging at the controls. Later he said he thought that I had fainted.

Then I started to ease out, swooping under the wires and again zooming skyward. Immediately I turned to the field. We had been in the air just about five minutes, and

there was no question of a thrill. Not since then has he asked for one.

I gathered Bob Rose and Dick Curwood that night and we went over to see Georgie Smith. I don't think that Mr. Smith was so friendly, and he wouldn't offer to go to the kitchen. But the little girl more than made up for it. She ordered a couple of friends for Bob and Dick and the three couples of us had a very pleasant evening. One of those few that stunt men have.

We danced until about two-thirty, when I decided that it was necessary to get some sleep, as I was to go on location with the Tom Mix Company the next day with two ships I had purchased for a picture called *The Forest Ranger*.

Two ships necessarily mean two pilots, and so I persuaded Rogers Airport to let Bud Creeth go in one.

We started off in old crates, one of which I was to crash intentionally in the picture. Before we got halfway Bud had a forced landing and almost crashed into a tree, landing in an emergency field, and because I tried to land I barely escaped a similar accident. Later in the afternoon my motor went dead and I had to pick a tough spot, and Bud almost cracked up trying to follow my example. Those were the great days of flying. It took us a day and a half to make four hundred miles.

We landed at an improvised field at Felton, from which we decided to operate. It was a low-lying plateau surrounded on all sides by mountains. Landing and taking off were not easy. It was necessary for us to spiral three or four times to get in and out.

Somehow the roar of motors seemed out of place in this country. As the detonations of the cylinders echoed and reëchoed from the side of the mountains it seemed almost as if it was their last angry protest against the intrusion of man.

And the giant redwoods, many of which towered two hundred feet into the air, seemed to watch this new development with patience only acquired by thousands of years of existence.

But two days later we began work on the picture and for me it was just another of those things—flying, stunt-ing, crashing.

My first stunt was a crash into the side of a barn. It was not a difficult feat, except that the building was but a foot wider than my ship. That allowed me just six inches on either side of the wing. And if the entire ship did not smash through the barn side and disappear into the interior the shot, ship, and all would be a total loss.

Have you ever tried to concentrate on two objects at the same time? The eyes simply won't do it. At least mine won't. It was therefore impossible for me to watch both wings simultaneously. For just a little bit I was rather dubious. A fair rate of speed was required, yet just six inches to miss.

At first I thought I would judge by watching one wing alone. The other would take care of itself. Then another idea came to me. I had the construction department build a window directly in the centre of the building. This window contained the usual four divisions.

I admit that it was with a little misgiving that I taxied

back some hundreds of feet from the barn and prepared to do the crash. I had to hit sufficiently hard to break through, yet if I threw myself and the ship in with too much power, I'd hit the rear end of the structure so hard that I might cause the rear supports to give away, in which case the entire building might collapse.

I arose in the seat and took one last look at the window, then, fastening the safety belt around me, I gave the ship the gun and I was off. I felt the wheels leave the ground, which meant that my speed was sufficient to give me good control.

How I should have liked to look at the edges of the wings! I wanted to glance at the corners of the barn, to see if I was right, but instead I kept my eyes glued to the crossbars of the window. And did that window loom up suddenly? From an inconspicuous object some distance away it was suddenly projected directly in front of the propeller.

The next second the knifelike edges cut into the thin wood and with a crash I was inside the barn. Before I knew it. Before I had time to shut off the ignition or the gas.

A second crash! I had hit the rear of the barn. But instead of the supports giving, the motor itself moved. The mount supporting it gave like paper and the OX5 was pushed up into the gas tank.

The stunt was a success. The entire ship was inside the barn. I had not so much as touched either wing as I crashed in, and as far as the little damage to the ship was concerned—that was expected.

With this one stunt under the belt I felt much better about finishing the rest of the stunts satisfactorily, and perhaps it was this confidence which carried the old Jennies over the hazardous territory safely the next few weeks.

Most of our work was at Bonny Doon, a section of particularly wild country in the altitudes. Here the redwoods were like huge church spires, they were so tall and so straight.

Sometimes as I would be flying, overloaded to the gills with camera equipment and a camera man, I got a thrill out of thinking what would become of the entire cargo if the motor should quit.

Norman Devoe, who was the Akeley camera man on the troupe, was detailed with me to get some thrill diving shots of the little group of buildings hidden so completely away in this wilderness. These buildings were constructed on a small plateau, surrounded on three sides by trees and on the fourth by a cliff that arose almost perpendicularly to a height of about a thousand feet. It was our duty to dive over the cliff and photograph the plateau and the set.

I don't think that Norman knew exactly the danger which was involved in those flights, but I do think if he had known he'd have acted just as he did. He had never photographed from an airplane before and as a matter of fact had never been up until we started out on this hazardous trip.

But I was fully aware of the possibilities should motor trouble overtake us and so was extremely careful about inspection of the motor before each trip. I would take out

the spark plugs and clean them thoroughly, as I did the carburetor jets and the magneto points. All gas lines were checked, and the motor was run almost five minutes before each take-off.

But it looked as though my precautions were all wasted. There remained but one more flight, one more series of dives at the clearing. I think we were both glad, and so on our last take-off we were filled with a pep which we had not felt before.

The old motor seemed to know it too and, like motors, seemed to gather the enthusiasm of the passengers. It picked up the JN-4 and climbed steadily toward our goal on top of the tree-covered mountains. Some minutes later we were up about fifty-five hundred. And then I pushed the nose of the ship down and headed for the cliff. We were now nearing position to make the dive. Devoe was standing up in the back seat, his hand on the unwieldy stick of the Akeley camera. Such a position made the ship slightly tail-heavy, but it could not be helped. He had to stand to grind. And the position was not one of great comfort to him. It meant that he had to fight the full force of the wind. No belt could be used, so the position was not exactly safe in a dive. The only safeguard he could use was rather a meagre one. He tied a piece of sash cord around his waist and to a longeron in the fuselage.

We dived. It was exceptionally steep and brought water from the overflow pipe of the radiator and gasoline from the air vent in the gas tank. Down the side of the cliff some eight hundred feet I continued, looking back

just long enough to see that Devoe was O. K. He was. Braced against his camera he was grinding away.

I drew up and made a quick climbing turn, and then I turned to get his reaction. He was smiling, nodding his approval enthusiastically. I thought that this showed considerable nerve, considering that this was but his third flight, and I nodded back.

During the climb upward and back into position for another dive we had a chance to wipe our goggles for the next and final thrill. It did not take long to get into position. And I levelled out about half a mile back of the cliff. I think I breathed a sigh of relief with the thought that this was to be the last of our really hazardous work.

Then I caught sight of Bud Creeth in another ship, flying about a mile away from us, and remembered that he too was engaged in some dangerous work with the rest of the troupe. It rather cheered me to see him, to know that he too was going strong. But as we neared our objective I lost him and gave over complete thought to our last stunt.

We were now but a few feet above the tops of the redwoods, and only about five hundred feet from the cliff. A few seconds and we'd be in it again. Now we were but two hundred feet from it. Devoe was set. I was leaning forward ready to shove the stick and put us into a real fast one.

Then without the slightest warning the motor missed. Just once. But my heart leaped up in count immediately. Just a few feet over the trees. No place to land. If it should

quit it would be a crash and a bad one! I attempted to lift the nose slightly to get more air between me and those redwoods. It missed again! I was now but a hundred feet or so from the edge of the cliff. What a terrific place for motor trouble. It would be too bad for both Devoe and myself should it die altogether.

But motors are no respecters of time, places, or persons. With one final wheeze and a cough it just ceased to turn over, and there we were.

I glanced hurriedly about, but unfortunately my observations had been correct. There was no spot that wasn't filled with redwoods, huge rocks, and twining undergrowth. In a last desperate chance I stalled upwards, and it gave me time to make a decision. But one thing to do. I could just about make the edge of the cliff. And then if I could but clear it all of the way down I might be able to crash in the little plateau.

It would be a bad one, for I'd have to side-slip to get in, and riding in the "golden chair" (or the front seat) as we called it, made it look rather doubtful for me. It looked as though both of us were due for a rest, either temporary or permanent.

I nosed over and just missed the rocks at the edge. It was then that I got a chance to take a quick glance backward. Devoe was still standing up cranking.

"Sit down!" I hollered, and turned back to put the ship into a slip. It was not easy with an excess load, and I knew that it would be no simple matter to keep it in one for the entire distance. Moreover, with him standing, and no motor, the thing became more and more tail-heavy.

After I was in the slip I glanced back again. He was still grinding! Surely he knew we were in serious trouble.

"Sit down," I commanded, "we're going to crash!"

Then I got exceedingly busy keeping the thing in what I figured to be the only manoeuvre that would give us a chance.

A hundred feet from the ground I turned to see if he was protecting himself, and almost passed out when I saw him still standing by his guns, grinding away. That was the last that I thought I'd ever see him. A side-slip from a thousand feet into the ground. Me in the front. A camera man standing up in back. I just kissed us both good-bye.

Well, we hit. For a few seconds struts and motor parts, wing panels and pieces of propeller flew around so fast and raised so much dust that I didn't know exactly what was happening. As a matter of fact I was temporarily out.

Then, as the dust cleared from the spot and from my brain, I waved part of the wreckage from around me and found a hole. I crawled out, and immediately hurried to the back seat. But there wasn't any. It had telescoped completely together. It was so crushed and broken that nobody could be alive. There wouldn't have been room in it for another stick. And Devoe must be crushed to death.

I turned away with a sickening feeling in my stomach. The first person I had ever killed in an airplane—and after all of these years of stunting.

Then I glanced at the wreck of the ship. I had never seen anything so demolished. The motor had dug a hole about four feet in diameter and about half of that in depth. It had hit so hard that it had bounced back again.

Gasoline was pouring from everything. Not one thing was unbroken. Even the wings were wrenched and torn from the body.

One of them was some twenty feet from the rest of the ship. And when I looked at it I gasped. My mouth must have opened pretty wide, but I couldn't say a word. There was Devoe! Sitting on the top of that wing, the handle of the Akeley camera still in his hand.

When I saw him he was rather in a daze, and kept looking over the broken handle with sort of simple perplexity. I wasn't much better; my head was bleeding slightly from a broken vein. And I really thought we needed an introduction to each other because we were as black as darkest Africa, from oil and dirt of the crash.

Benny Southland, our mechanic, came running to us, and then only did we fully come to our senses.

Five minutes later we were joking about our escape, and I congratulated Devoe upon getting the first actual air shot of a crack-up, which was really quite remarkable. In the picture you could see the ship heading for the ground. You could see the ground approaching and also the shadow of the ship and the ship meeting the ground. Then dust and a few parts starting to scatter around and about.

I certainly give credit to that camera man. One of his few times up, and he deliberately ground against my advice. It is strange, but if he had followed my instructions he'd have been killed, for he'd have been ground to bits in the back seat. By standing, the impact had thrown him clear. But I'd like to have been on the side lines and

watched him as he flew out and came to the end of his safety rope. They say he turned about four complete turns, and landed sitting!

A week or so later we left the location, for which I was very glad. In the first place I wanted to see Georgie Smith again, though I knew that she'd be true to me even if I were away a year instead of a few weeks.

My first surprise in getting back to Hollywood was to find that Leo Nomis had broken a collar bone during the making of *Manslaughter*.

Leo was one of the most daring of stunt men. For years he took every chance that was offered. Wrecking automobiles and stunts on motorcycles were his pet pastimes, though he was as good a pilot as ever flew a ship.

In the stunt in which he was injured he deliberately jumped a motorcycle from a small take-off in the road over the top of an automobile. Both were making tremendous speed and when Leo hit the take-off it hurtled him and the cycle high into the air—and they successfully passed over the automobile at right angles. But when they hit the pavement Leo slid and bumped with such force as to tear plenty of skin from his body as well as fracture the broken collar bone. However, everybody considered him lucky to escape alive. And incidentally it is one stunt which will live a long time in the history of thrill-making.

And yet we cannot all escape so fortunately. Someone has to pay for the luck of others. Apparently science has no relationship to the law of averages.

Shortly after Leo Nomis did this stunt for *Manslaughter* Dick Curwood was engaged for some rope-ladder work

for an independent producer. Dick should never have gone back into the aviation angle after he broke his back on that stunt for Fox. But who can persuade a man that he is through in a profession? Not even the injuries which most of us acquire cure us. We go back to the well once too often.

For this stunt Dick picked one of the shrewdest pilots on the West Coast—Frank Tomick—and they took off for the work. Dick had put on weight, which made it difficult to handle him on the wings; but this work was directly below the fuselage, so Frank found little difficulty.

At a signal the stunt man climbed from the seat and worked his way slowly to the leading edge of the ship. He smiled back at the pilot as he let his legs down and felt for the ladder. Then his head and finally his hands disappeared under the wing and Frank Tomick got into position to do his work.

But it was a peculiar feeling that Tomick had. He did not feel the jerks which the pilot usually feels as the stunt man goes down the ladder or changes position. He could not feel the weight of Dick's body, being blasted in the propeller stream. Moreover, when he was manœuvring there was no evidence that Dick was doing a thing on the ladder.

After ten minutes Frank was worried. Something must have happened. He had never felt Dick on that ladder once. Frank sensed that a tragedy had happened. He banked the ship sharply and, sure enough, the ladder was empty. There was no Dick at the end of it. It ominously

floated, whipped in the wind, mute evidence that Dick had joined that ever-growing Squadron of Death.

It seemed impossible to Frank. The two had done many stunts together, and this was a very simple piece of rope-climbing. Could he have gotten discouraged? But no—impossible! Frank landed with the rope ladder dangling, and again and again he searched the bottom of the ship—but there was no doubt. Dick had failed to come back this time.

Personally I think his broken back gave away at a crucial moment and he tumbled into space, just another of our workers to pass into the Great Beyond.

Hours later they found his body in the mountains, crushed and broken. The horrible details had better be left unsaid. Only those whose imagination runs to the highest peaks can conjure the shape of his head—and his body.

Thus another of my dear friends passed out, and I rapidly came to another conclusion for my own good. I'd never so long as I stunted in pictures make a great friend out of any one of my companions. It hurt too much when they were killed. It affected me for too many days and weeks afterward.

XIX

SPECULATORS IN DARE-DEVILTRY

THE death of Curwood seemed to start things all over in a bad way. B. H. Delay lost his wings at twenty-five hundred and crashed into the ground. H. C. Lippiatt, an experienced pilot who saw the accident, said that it looked as if he might escape because the right wing folded back in a sort of V and the ship seemed to come down rather slowly. But it was only deception due to their height. As they neared the earth their real speed was apparent and of course they were ground into bits.

Following this Hoff took off, flew over Venice, California, and suddenly went into a dive. We all thought that his stick came loose, leaving him without controls. Regardless of the cause he never came out but plunged right through the heavy planking and pylons of the pier. It takes some force to drive an entire machine, motor, fuselage, and pilots through a structure of such strength.

And all during this period I was exceptionally busy. I had to do a drop from one airplane to another for Larry Semon. Not an easy change, hanging by your knees from an unstable rope ladder and waiting until the other plane gets below. In the first place, I don't believe that anybody's judgment is as good when they are hanging head down,

because the head throbs with blood and the eyes bulge. Then, too, it is impossible to wear goggles or helmet, and so the eyes are doubly subjected to punishment. The hair is whipped and beaten until you can't comb it for days after. Even your clothing suffers. During one picture eleven shirts were torn from my back in doing wing tricks.

In another picture I was supposed to be dreaming, and during the course of the nightmare I was to believe that I was walking the wings of a ship. In order to get the effect I had actually to walk wings in a pair of pajamas. So I dressed in my one and only pair of silk pajamas and we took off for the stunt. It was a cold day, and in nothing but pajamas I felt just about as comfortable as a moulting ostrich would among the icebergs.

Finally we reached the proper altitude and Arthur Goebel, who was flying me, gave the sign that it was all right to climb out. I looked over at the other ship. It was in position, so in my bare feet I clambered out to the last strut and then scaled the wires to the top wing.

And here my troubles began. First a button tore from the shirt of the pajamas. Of course that let in plenty of air, so I had to fold my arms to keep the thing from blowing completely off me. Then one of the legs split and I knew that silk pajamas were all wet for walking wings. I reached down to try to cover up the bare leg and the shirt blew in two—right down the back. Well, I want to tell you that it took less than two minutes for the wind to completely undress me. A fine situation to be in! Directly above a city of a million and a half, without a stitch of clothing.

The pilots were laughing, so was the camera man, but I couldn't and still can't see so much humor in the situation. Shivering and disgusted—and no way to get down decently. I got back into the seat and argued with Art, and I can hear him laugh yet!

Well, he finally landed us at another field and he kindly let me use his leather jacket, and when we came to our own field we taxied right into the hangar.

Following this Maurice Murphy, who looped an airplane all of the way from San Francisco to Los Angeles, and I put on a fight on the wing of an airplane. Not difficult, but in order to make it effective and thrilling it was necessary for us to resort to falls and positions which the slightest error in judgment might convert into more than a mere farce fight.

On the same day in which we finished this fight I was engaged by William Fox Studios to do a fall from a twenty-five-foot parallel to the ground. It was not a jump, just a running dive, landing on my chest and hands twenty-five feet below.

Now twenty-five feet does not seem like much of a fall, but when the full force has to be taken by the lungs, ribs, and hands it really becomes quite a feat. I did not feel particularly like doing it because I had already had enough stunts for one day, but as long as I had accepted I could do nothing else.

After reporting to the assistant I went to a dressing room, where I hastily slipped into the clothes provided for the double, and came back ready and willing to get it over with.

I knew that none of those watching realized how hard I had worked that day, and I knew that it was wrong to do these things with weak, tired muscles. I had none of the vitality which is the safeguard of a stunt man. It was all I could do to force a smile. Cameras were set up on the parallel and on the ground. They were going to shoot it from both angles.

Finally the director climbed up to the stand and casually sat in his chair. Around him were his assistants and some of the usual crowd of his "yes" men.

Without a word to me he turned to the camera man and gave him the word to grind. Then he bellowed through his megaphone: "All right, get set—jump!"

I did. Clearing the railing, I flattened out, making sure that my feet were quite some distance higher than my chest, and hit with a thud that almost knocked the wind out of me. I knew that it was done right. It should have been perfect. There should have been no retake. Therefore I was much surprised to find that I was required to do it again and again.

Each time I did it the stunt became harder. I seemed to hit the ground with greater force, or was not able to break the fall as much as I had before. I was becoming dizzy. Five times I had done it now. And I wondered just why the director and the staff laughed each time I hurtled myself over the railing to the ground below.

At that I had no kick coming. I was to get thirty-five dollars a fall—and a retake was the same price as the first jump. But there is a limit to all things. At the end of the sixth jump I was so sore that I could not get up imme-

diately. My ribs and lungs were aching terrifically, yet I did not hear the welcoming O. K. Again—would I have to do it? If they did not get what they wanted soon, I'd be breaking bones.

But while I lay there Bob Rose came over to me and whispered: "Dick—don't do it any more! The director is having you repeat it for his pleasure. Better stop before you get internal injuries."

As I got up I looked them over. So this again was the attitude of those for whom we made thrills! As far as they were concerned, we were just a nonentity. A bunch of flesh thrown together to furnish necessary footage for pictures—and when we were worn out, or killed, they could always find more fools to take our places.

Of course the real producers value us, and always will. We are a necessary part of making pictures. They are wise in consulting those of us who have proved by years of the work that we can usually walk out of any stunt we contract for. But why don't they take those few good stunt men and let them make enough money to retire gracefully after a few years? The stars get their thousands of dollars a week. Some directors get more than the stars. Assistant directors range from one hundred to five hundred a week. Yet the poor devil who does the thrills is lucky to be held on longer than a few days.

In one stunt which I did for a big company I was engaged to deliberately crash an airplane. I had a verbal contract with the highest men in the studio—the price was to be five hundred. And this price was just about half what I figured the thing was worth.

I did the crash to their satisfaction, and when I went to collect my check it was for three hundred dollars. Well I knew that the courts of justice were no good place for a case of Stunt Man *vs.* Studio. In the first place I'd lose the suit and in the second I'd be barred from the lot.

Once before I had been engaged to do a stunt and had not been paid my full price. Natural indignation at the tyranny and lack of justice made me demand my rights. Eventually I got them, but I did not work on that lot again for six months.

Not all producers are like this. The usual big producer not only lives up to his word, but if you are hurt the company gives you a bonus. Perhaps no company in motion pictures is more generously inclined in this way than Famous-Player-Lasky. When I was severely injured in making one of their pictures they voluntarily put me on half salary for six months.

But not many are really so fortunate. It has been my fortune to make more money for my stunts and to receive better treatment than the usual stunt man. Perhaps I pride myself too much when I say that they may like me a little bit.

Still it cannot change the attitude, which eventually eats into your heart. Sooner or later the work will get you, too. No one can live indefinitely doing hazards which hold so great an element of danger. That horde of faces beyond is not much different from those here. Care lines show early, and scars on the body and the brain multiply with great rapidity.

How different my attitude these last few years from

that of the fresh youngster about nine years ago. My body is still in perfect physical shape, but my ambition to get any place in pictures is gone. "Once a stunt man always a stunt man." I heard it from the beginning—and scoffed at the idea. Surely one who was good in his own professional line had a chance to rise in any branch of the profession. But no! They were right. A stunt man, race driver, flier, or crash engineer (as I have been called the last few years) has not one chance of ever reaching solid success.

It is because the producers don't believe in him. If he had brains he wouldn't be doing it. If he stays with it long enough he'll become "cracked." And when he breaks he'll kill himself by accident or by design. It's a torture, a misery, for a thinking man to kid himself from one year to another—to find in the end that the door *is* absolutely closed.

Yet whose fault is it? Producers want nobody to stunt for them who wants to do anything but stunt. That's settled. Men who go into it, then, should not expect advancement, and for the most part they do not. Just occasionally one pops in, like myself, who thinks that he can break time-honored precedent—and they have to take their bumps the same as the others.

By this time I had absorbed the hopelessness of my clan somewhat. I got to live life as the others did—from day to day, not thinking of to-morrow, perhaps not daring to. All they and I knew was that to-day we were living, and after all it is the only day that counts in the lives of us who gamble.

We are gamblers! The greatest speculators in the world. Some people are fortunate enough to be able to gamble with money—others in business prospects. But not having been willed money or valuables to gamble with, we do it with our lives. It really is a bet—every time we take a stunt we bet so much money against a life that we'll pull through unhurt. Naturally you can't win every bet.

My own stunts I imagine I have reduced to a point beyond gamble, but have I? A few more crack-ups—one jump too many—and I may be just as far wrong as anyone.

Then why do it? Why not give it up? Questions by hundreds pour in in letters—are asked by our friends and even our enemies. Why? That depends on the person. Dick Curwood did one too many that his children might have an education; Burgess, so he might some day be a power in aviation. Bob Rose wants to quit but can't—he needs an operation. Most of us are in it for the money one way or another. Circumstances force us there and the rut is too deep for us to jump out. We get dependent. We forget how to do anything else. And after a while most of us lose any sense of good business—if we ever had any.

With me it is partially the love of the game that keeps me with it. I don't want to leave it. It is the struggle that I like. Why should I give up crashing airplanes and automobiles, give up dives and jumps, when I take keen satisfaction in accomplishing the unusual? Perhaps I am destructive. I like to hear the crash and bang of an airplane breaking up around me. I really enjoy the sensation as an automobile hits and rolls down a cliff. I keenly

feel the thrill as my body falls from a height. Surely it is all destructive—but at least I have turned my destructive inclinations to a constructive channel. Criminals who are destructive are small, narrow. They harm others. With us we can hurt no one but ourselves.

Paul Malvern slipped at the top of a mast and fell almost a hundred feet into the water, lighting flat on his side. It was a terrific blow—knocked him unconscious—yet he laughed when he came to.

Gene Perkins was doubling in one of William Desmond's serials at the U. He was on top of a corrugated iron roof—the eaves of which were about forty feet from the ground. Gene was to roll down the roof and then fall the forty feet to a mattress imbedded below the surface of the ground. He expected a hard fall, but not as hard as he took. Just as he made the last roll his coat caught momentarily in the eaves—just enough to keep him from hitting the mattress. And he fell the forty feet to solid earth, hitting squarely on his head.

Everybody thought that he was killed. Quickly he was loaded into the nearest car and rushed to a hospital. When about halfway there he regained consciousness and his first words were: "Give me a cigarette!" Someone handed him one and he sat up.

"Where do you think you're taking me?" he asked, apparently puzzled at his presence in the car.

"To the hospital, of course—you're hurt," answered the assistant director.

"Hospital hell!—just because I missed. Now let's go back and do it right." And he did.

For this kind of work Gene was drawing about seventy-five dollars a week, though I think toward the last of his contract his salary was raised. And Gene was an all-around man. He did exceedingly high fire and net dives, changed from airplane to airplane—anything required of a good stunt man.

So you will find that although compensation plays an important part in the calculations of a stunt man it is not purely for money that he sticks to the most dangerous game in the world. And you will find that the attitudes of the majority of us are very similar. Perkins and Malvern are not much different from Duke Green, Dick Curwood, Harvey Perry, myself, or any of the others. A broken bone or a hard bump is expected as surely as a slump in the stock market.

Only the stock market is not so much of a gamble. Sometimes the studio casting office will call us and tell us to report at once to a certain director. Upon arriving and conferring with him we find that he wants a high dive or a fight and fall from a cliff. But he has not had time to select the location. Therefore he cannot actually tell us of the danger involved in doing the stunt. Or maybe he has seen the cliff. He knows the effect he is after—and he may try to describe this effect to the stunt man. But he has failed to take in surrounding conditions—the depth of the water below; overhanging rocks which we must jump to clear; adverse wind conditions. Perhaps, even, the location is hundreds of miles away. Nobody has ever been there. A stunt man is taken along to perform the thrills

and neither he nor the studio has any idea what may be required of him before he gets back.

The majority of stunt men never rise to above one hundred and fifty dollars per week—and they have to be plenty lucky to get that. Such salary is not paid the best of them for a long time. There is no such thing for this kind of animal. He is lucky to draw such money by the picture, for it is only then that he can actually say that he earns anything without literally paying for it with his body. Usually with him it has narrowed down to this: "If I don't stunt, if I don't risk my life, I don't earn a dime."

Bob Rose got a hundred and forty dollars a week with Ruth Roland serials for the last two this star made. And I want to say that Bob earned every cent. The stunts that he was required to do were numerous and at the same time exceptionally difficult.

One in particular involved considerable danger. An old-fashioned stagecoach, drawn by six horses, was to run away on a high clifflike road. The location selected was one of the many winding, twisting mountain roads on the coast range. To make six horses and the coach turn these hazardous bends required supreme skill.

But Bob was used to such chances. He figured everything mathematically as usual, first walking the entire course and stopping at every bad bend. At one in particular he paused exceptionally long. Should the horses and carriage accidentally go over this one there would be a sheer drop of almost a thousand feet.

The horses were hitched in pairs. And Bob sat on the driver's seat high above with the three pairs of reins in

his hands. Then the cameras were placed along the different points of the route and everything was set.

With a crack of the whip they were off. And I mean off. Evidently the horses had not been exercised for some time. They were r'aring to go. Soon they actually were running away, and it was with great difficulty that Bob could control them at all. Down steep grades, around corners at dizzying speed, scraping and knocking the cliffs on both sides. Several times a wheel skidded over the side, and it looked as if Bob and the coach would be thrown for a loss. But he stuck. It was perhaps his only chance.

It is ever the little things which ruin our calculations in life. And so it was with Bob then. A bolt came loose, fell out of the whippetree, and the tongue of the crazy contraction dropped in between the six horses.

Bob saw it instantly—and knew just what it meant. Any minute one of the leading horses might trip on it, and then there would be a terrible mess of wheels, carriage, horses, and man.

Without a moment's hesitation he climbed from the seat, down onto the loose whippetree, then directly in between the horses to a point almost at the end of the tongue. If his luck could but last a few more minutes he would be able to reach and remedy the difficulty.

The horses were already in a frenzy. They were actually running away now. For nothing knows so well as a horse when something has gone wrong. They were in a lather of white sweat as they raced madly around the steep banks.

Bob was busy. He paid no attention to the increasing speed of the horses. He couldn't. His work of the moment

was to repair the break. He knew that his life was in jeopardy. That if one of them tripped it would surely almost be over for him. Six mad horses down and kicking would make it almost impossible for a man to escape.

He was just at a point of success when, with a lunge, the front right horse caught in his harness and plunged to the ground. Then things happened. Bob realized that it was too late to help the oncoming mess. He tried to leap from in between, before the others piled on top of him, and he almost succeeded. Almost, but not quite. The other five horses went down so quickly that it was impossible for him to act. And into this jumble of horses and man piled the coach.

The horses were frenzied, wild. They were screeching and kicking in the harness, and under it all somewhere was a man.

The entire troupe came to the rescue, although everybody knew that it was too late for the dare-devil that was beneath it all. Some were as excited as the horses, some who were used to accidents were cool.

The stagecoach was eventually cut free and then in short order the two horses on top were released and taken away. But the last four were difficult to untangle. Even with the aid of knives and hatchets it took almost five minutes to get them parted.

Now Bob could be seen, lying under the neck and fore-legs of the first horse to go down. His arms were clasped tightly around the hoofs, his head buried on the horse's chest. Of course everyone thought he was dead. That was the position in which he had been thrown, for the horse

was still kicking violently. Still it was a peculiar thing. Those back feet were not touching him at all and he had the front ones helpless.

A few seconds and they pulled Bob out feet first, but they had to break his hold. Without question someone grabbed his feet, someone else his shoulders. Quick emergency treatment was extremely important. Then for the first time he instead of the horses did the kicking.

"Say, listen! Where the hell do I get off? Let go! Don't you think I'm old enough to walk?"

They dropped him, and he arose to his feet.

"Dammit!" he said in a surly voice, "you'd think someone was hurt, wouldn't you?"—and he got into a studio car and went to his dressing room. Another day of thrills finished.

XX

STARS AND DOUBLES AND AN ARABIAN HORSE

A MECHANIC at Clover Field, Ralph, took one of my ships up and crashed it into an army plane. Both my mechanic and his girl were instantly killed—the stick going clear through his stomach. The service men fared better, though it cut the forehead of one of the officers open and laid his entire face, including his nose and lips, right down on his chest. It was one of those things that could have been avoided because the boy did not have permission to go up. He had soloed but a few times, and that without knowledge or permission from anyone.

When the two ships collided, due to carelessness of the air rules, while coming in to make a landing, Ralph did a complete loop and landed at the bottom of it.

I was not there. At the time I had two airplanes on a sky backing at Fox and was superintending the taking of some fake shots for a comedy drama. Of course I went immediately to the scene of the accident, so that I could get a full report of the details. But when I got there officials of the field had cleaned up the mess so neatly that I went back to my work almost immediately.

When I got back to the studio I hurried to the set. At

first nobody noticed my presence, and I joined a group who were listening to someone tell an interesting story. People of the troupe were crowded all about the speaker, so naturally I elbowed a little nearer. A man who claimed to be a stunt man was narrating some of his harrowing experiences. He was graphically describing how he had made a change from an airplane to an automobile. It was a very difficult change, from the wing skid to the back seat without the use of a rope ladder. He told of the difficulty they had in getting into position, and how when he finally let go he hit the bare boards of the back seat so hard that it knocked him out. But it was a great change—everyone expected it to be the thrill of the season.

So when they went into the projection room to see it everybody was naturally curious. All waited impatiently while the rest of the "dailies" were being flashed on, and as one shot after another appeared and no "change," the troupe became impatient. Then came the shot (the last one on the reel), and instead of the beautiful change they all expected to see, there was nothing but a plain, blank piece of film.

The camera man had forgotten to open his iris!

The stunt man who was telling the story said he almost fainted as he saw that useless piece of film. So did I as I heard him tell it. The story was correct all right. There was only one little mistake—I was the one who had made the drop!

Some stunt men are like that, but only those who never accomplish anything. The Orpheum circuit booked two who had never been in a big motion-picture studio on the

West coast, as the greatest "doubles" motion pictures ever had. Several of us went down in a body to listen to their act, and of all the weird tales you ever heard, the strangest were from those two self-made stunt men.

But people of that kind are not uncommon. I have heard stars sit around right here in Hollywood and tell some great fish stories: how they escaped in this crack-up, how they made a certain change from airplane to airplane, or how athletic they had to be to perform the dangerous leaps and dives required daily from them.

One in particular used to delight in telling of a narrow escape he had in making a fire dive from a burning building, and he would turn to me for verification. I got to be quite a proficient liar backing him up.

Well, I guess it's expected of us. When we sign a contract we have to do more than earn our money by risking our health. It's better that we tell how brave some of our stars are; otherwise we couldn't work for them.

Which reminds me—did you ever hear of a double being hurt or killed? The publicity attendant on such deaths is usually confined to the official announcements. But if a star gets a scratch of the toe, or chews a finger nail too close, the publicity department immediately has the star in the Hollywood Hospital in serious condition.

Female stars are particularly prone to the dramatic. If they can't advertise more than a beautiful face it's because of some late accident to the lower limbs. One in particular who was known as a daring girl on the screen made a tour of the Orpheum circuit and very dramatically told of the great perils she went through to give the public

thrills: how much punishment she subjected herself to to produce dramatic moments, how she loved to do it.

"Just for you, my dear public," I can still hear the chant, "and I hope when you see my pictures you will realize that I, at least, take these extraordinary chances that you may have your thrills." Then she showed flashes of the various stunts she had done for ten or fifteen years. Ye gods! Every one of them was the work of her stunt man, who is down and out and broke at present.

And I can still hear her holler, "Mama! Mama! Mama! Oh! I'm so afraid! Mama!" when they had her tied by about six ropes and a couple of belts as she hung over a ten-foot cliff.

Of course I do not mean that some stars do not do their stuff. Tom Mix does and always has done most of his work. So also does Hoot Gibson, who is one of the best horsemen in the world. Ken Maynard and Buck Jones all do their own risks with horses. Buddy Rogers and Dick Arlen both flew many hours with a pilot in *Wings*.

But the majority do not take their own risks nor do they pretend to. It would be folly for them, as their salary is such that they must think twice before trying anything hazardous. Then, too, the studio could not afford to have these valuable players injured, thus tying up an entire production. This would cause a great loss both in time and in money.

The stunt man's attitude toward the stars is mostly a passive one. He is the one man in the studio who must be a good listener, and incidentally one of the few on the set who cannot get temperamental. After a stunt he holds his

exact position, so that the star may climb into his place and continue with close-ups in order that the public will not notice the break in the film at all.

After I had done one very spectacular crack-up I held the position in which I ended until the star was ready to take my place. Then, as I crawled out of the wreckage and he crawled in, he said one of the finest things a stunt man could hear from a featured player. Turning to me after he was properly placed he said, "You know, Dick, it was a great crack-up, and to think I have to take the credit for it doesn't seem quite right, does it?" Naturally you'd expect that from Buddy Rogers.

I smiled and thanked him. He was one of the very few who ever thought of the man who helped in a small way to make thrilling pictures thrilling.

All in all it is a peculiar position. The stars think that a stunt man is just a little above an extra. The producers think he is a little below a moron. The public has never heard of him. It thinks that all thrills are faked or double-printed.

And the stunt man. What does he think? He scorns the actor who is really afraid. This type of person he naturally avoids, whether the actor be a success or just a star. The producer comes in for his share of hot-house adjectives, but these usually do not reach the ears of these high and mighty personages.

Perhaps the reason for part of the natural antipathy existing between the stunt man and the producer is because of the professional go-between, a troupe business

manager. This man usually blames the main office when he can find no other excuse for cutting the price of a stunt, or when he refuses to give the man his price. How often have I heard these grave robbers say, "The budget won't stand another dime. It's all we can afford to pay." Yet the main office has not the slightest idea what it's all about—this bartering of pennies for thrills. And I've seen these same business managers spend thousands where it didn't count and never could show in a picture. Sometimes they take an entire troupe on a location where a double, a couple of camera men, and an assistant director would suffice.

Peculiarly, with all of these drawbacks a stunt man is popular. There are those who admire his attitude toward life, who know the struggle he is up against and encourage and assist him. After he does a stunt he is more or less the idol of the troupe. It is fickle praise, because after all this is a fickle profession. The greatest stars of to-day may be forgotten to-morrow.

But I believe every star and every producer has seen some stunt man do some stunt which has impressed itself indelibly on his mind. I do not believe that Sol Wurtzel, West coast head of the William Fox Studios, will ever forget some of the aviation work which I have done around and above this great plant. Nor do I think that Ben Jackson, who holds a responsible position with the same company, will ever forget the time I thought that I'd been overpaid for a stunt and refunded part of the money to the company treasurer.

Even our own companions have a healthy respect for

one another's abilities. Personally I can think of no greater stunt man than Ray "Red" Thompson.

Red was built like a Yale fullback. Not so tall, but stocky and with shoulders that were massive. He had a grin that was known from coast to coast, and reached almost as far. He was not bad-looking—there was a lot that was attractive about him besides his red hair and freckled face—and he was exceedingly popular with all of us. The way that man could handle horses was a pleasure even to Tom Mix. And ride? It seemed as though he were sitting in a Turkish rocker. Once he made a bet that he could drink a glass of water while a horse was bucking—and he won.

But he won his fame jumping horses from cliffs into water. Where I considered a dive dangerous he would walk up and survey it and then take a horse over it.

One dive in particular lives among the tales of wild stunts in Hollywood. A cliff which was about sixty feet in height was selected as a possible thrill for a Western picture. The director wanted a horse to jump over it with a man clinging to the back of the animal. The producer agreed that there could be no better major stunt, but where was the man that could do it? What jumping horse existed that would negotiate the leap? Professional cowboys and trick riders alike shied at it. It was just one of those things which could not be done. For two weeks they hunted in vain for someone willing to take the risk.

And then Red came back from location. He had not been in town an hour when his telephone was buzzing with calls from the studio. He went to the location and sur-

veyed it carefully. The conditions under which they proposed to make the thrill were terrible. It was no wonder that the rest of the professionals had refused.

In the first place there was no runway or approach. Just an uneven pathway which zigzagged back and forth, and a rock arose abruptly half a dozen feet from the cliff. It would be necessary to make the horse jump this first or remove it from the path. The cliff itself was not perpendicular, but slanted, making it necessary for the horse to do a distance jump as well as one from height.

Red turned to the location manager.

"It seems to me," he said, "that you bozos are trying to kill both me and a horse. Is this the way this thing will have to be done? Won't you let me pick a spot to do the jump?"

"No," answered the assistant. "This is the spot which the director says is ideal."

"And you're not going to clear a runway?"

"Certainly not. It would ruin the effect."

Red yawned. "Well, I guess you're not looking for me." He got into the car and directed the chauffeur to take them to the studio.

"But," said the assistant, "they said you'd do any jump in the world."

"Yeh? Well, how deep's that water below the cliff?"

"I—er—why we haven't measured it yet."

"That's great," said Red, "but I happen to know. I've already had one company bring me out here to survey that cliff and I know what it's all about. Now I'll tell you. If the company really wants that dive and wants me to make

it, all they have to do is to clear a runway four feet wide to the edge of the cliff. Then when that's finished have them put a few sticks of dynamite in the water below and blast a hole so my horse won't hit bottom and break all of his legs, or split his belly open. I wouldn't make my horse kill himself for you or the studio or all of motion pictures."

The next day the same official called him, and Red was told that if he would do the stunt the conditions which he had outlined would be met. So the contract was drawn and on the day Thompson led his trained jumping horse up the incline.

The rock had been removed, a smooth path some sixty feet long had been cleared, and the water below was almost fifteen feet deep.

No cameras were on the top of the cliff. All were set up below in order to catch the full effect of the spectacular dive. The final instructions were given, and Red mounted his horse at the end of the runway. On the side lines was an assistant, who was to give the signal that everything was in readiness.

What a feeling, a thrill, a man gets as he sits and waits for the word which means that he is to do something never before attempted! You sit there and wonder. You philosophize on your judgment. Is it really possible to do this stunt and not get hurt? Or are you overrating your ability? If the latter it means hospital or morgue. The nerves are all keyed, your eyes are clear and bright, for the excitement is bound to pervade your entire system as it does the systems of those around you. Your muscles and mind

are ready, anxious. If you knew it to be the last moment of your life, knew that in the next few seconds they would fish you out broken and crushed, you would not want a delay. Everything within would be hollering to you to get the stunt over with.

Even Red's horse seemed filled with excitement. It pawed and jumped. It reared on its hind feet and chewed excitedly at the bit. It knew, for Red had many times before used him for this work.

Then came the signal. The assistant director had moved out of range of the camera. Red leaned over and stroked the side of the horse's neck. He said a few kind words to him. Then he drove the horse forward at full speed.

For fifty feet they seemed to fly, the animal digging his forefeet into the rock and turf viciously. His tail was straightened out behind him. His lean muscles stood out like knots, and his thin belly heaved with excitement and exertion. A beautiful animal, this white horse. As brainy and as courageous as his master.

Then for the first time the horse saw the cliff. Before him was an abyss such as he had never before experienced. Surely these men could not mean for him to jump that. Even a horse has that primary instinct, self-preservation. He dug his hind feet into the rocks, scattering a shower of sparks. His front feet stiffened, and although he was but ten feet away when he decided that he was not going over, he stopped at the bare edge of the cliff.

With a frightened snort he backed away and stood there meekly, as if partially ashamed of his lack of nerve. He did not rear nor paw now. His poor front legs were shiver-

ing with unnatural excitement and fear. He was panting and wild-eyed. It had been a narrow escape. The most he had ever jumped before had been slightly more than half this distance.

Red patted him again and, dismounting, led him back to the starting point.

After the horse was sufficiently calm they tried it again, but with no better success. He made the spurt, approached the cliff, but when he saw that great distance before him he went wilder than before. He knew that he had reached his limit. He feared that terrific impact to the tender muscles of his belly. He knew that at thirty or thirty-five feet the shock even to a horse was painful, and this jump was beyond his comprehension.

But the jump had to be done. Red had given his word that it would. For the third time the horse was led back to the beginning spot, and this time he was blindfolded. He could not see where he was going. He could not know when the edge of the cliff was reached. He would be given the reins and they would be off.

Red did not laugh. He disliked fooling his white Arabian, but he did not want to spoil a day's shooting. Moreover, it was taxing his own nerves to be prepared for the plunge, to be all set to leap from the horse as it leaped from the cliff. To be fooled was not more pleasant to him than the leap was to the horse.

The blindfold was in place, the horse calm. Again they started. The horse put his shoes into the ground and they were off. This time it was sure. The cameras were grinding. The horse was now in view from the bottom of the cliff.

But a few feet remained before he would make the leap. Everyone was tense. Again the drama of great moments in the lives of little stunt men was at hand. But no! The horse suddenly dug his front feet into the turf, bracing himself with his back, and in the very same spot where he had baulked before.

That horse could not be fooled even by a blindfold. His horse sense had told him that this was just a ruse, that he was covering the same ground. And he so judged his distance that he stopped on the very same spot. Horse sense, horse judgment, is far superior to man's at times.

The stunt man scratched his head. For the first time the Arab had the better of him. Then again the horse was led back. The blindfold was removed at his owner's command. And for five minutes Red kept everyone away as he talked in a confidential, soothing tone to that high-strung animal.

Again he mounted. He did not say one word to those waiting. He let them give the signal. He leaned over and smoothed the mane of the horse with his hand, and petted it with words and soft slaps. Then he gave the horse the gun. I mean he started it down that now well-trodden path. He urged it on. As before, the horse was going like nobody's business. They were almost to the spot where everybody knew the horse would dig his feet in and put on the brakes. Almost—but at that moment the unexpected happened. Red turned in his saddle and gave that animal a terrific slap on the rump. The Arab forgot to dig those front feet in or to hold back with the rear ones. Instead, he was so surprised that he leaped with all four far up and out into the air.

It was a beautiful leap. It carried him beyond the edge of the cliff and they started falling. In a graceful semi-circle they turned over in the air. The horse's head was straight down. Now they were on their back. And Red had made no effort to leave. Evidently he was going to hit with the horse. More than that, it looked as if the animal were going to land directly on top of him.

It did. With a terrific splash they both hit and a spray of water and foam many feet high arose as they disappeared under the water. A few seconds later they came to the surface and Red climbed on the back of his beautiful mount. He rode him to the bank of the pool. It had been a perfect dive. Just what the company wanted for the picture.

But Red was not paying any attention to those that crowded around him. He was leaning over the horse. His rough, freckled hand was around the animal's neck.

"I'm sorry I had to do it, old man. It was a dirty trick, but it's the only way I could get you to go."

The animal was standing there very straight. The nervousness was gone. So was his jumpiness and unsteadiness. His big eyes were rather pitiful to look at as Red handed him a lump of sugar. There seemed to be something aggrieved in them, something a horse would like to tell a master.

Red turned to the troupe and said: "Arab's feelings are hurt. He didn't mind the jump one bit, after he got started, but that's the first time I ever hit him in my life."

XXI

TROPICAL WHALING—TWO MISHAPS— THE SQUADRON CLAIMS GENE

It was shortly after Red jumped his horse from the cliff that he was sent to the South Sea Islands on a tropical picture. On this picture he was not a stunt man, but for the first time in his life was offered a technical job. This particularly pleased me because Red had been hitting a pretty tough pace, and the trip would give him breathing space to recover the vitality which he had lost during his long stretch of stunts.

I believe that these brief pauses in our work keep most of us alive. It is seldom that one stunt man or one flier is killed. Usually a streak of bad luck carries an entire group of us with it. Perhaps this may logically be superstition, but if it is, it is a pretty general one among us.

Looking over my career, I find that these periods occur at a particular time of the year—a period which extends from the autumnal to the vernal equinox. Most of my serious accidents, those which have scarred me or sent me to the hospital for any length of time, happened within such limits.

I do not think that this period affects all of us. It just happens to be filled with potentiality for me. I know that

Red did not believe that there was any season either for him or me. Nevertheless, he was as pleased as anyone with the thought of a long cruise and nothing to do in the way of hazards, except a little swimming among the sharks.

But all of us are subject to many surprises and he got his on that trip, just before the expedition was ready to sail for home. The tropical shots were "in the can," with the exception of one, and in that an element of luck figured. The boat with its motion-picture company must sail in tropical waters until a school of whales was sighted. The whales would be a signal for action. The boat would plough into the centre of them and wait for the right opportunity. When one of the giant mammals came up alongside a stunt man with a harpoon was to jump overboard and dig the spear into the flesh of its back.

Of course this was not really the way in which these brutes are usually obtained—except in tropical countries. There hordes of natives row out into the Southern Pacific in small canoes to await an opportunity for the battle. But as this was to be a tropical picture, everything in it had to be true to life, even the spearing of the whale. For the stunt one of the best and most daring of swimmers was on deck. He had guaranteed to accomplish what was wanted for the picture, and had been taken on the trip for that specific purpose.

Always while there was daylight there remained a watch in the crow's nest and another in the prow of the boat. But it seemed that the whales knew of Hollywood's intention; at any rate the men's watchfulness was unrewarded. It

began to be a discouraging search. It looked as if the thrill would have to be faked in the studio.

Then one bright tropical morning came the call from the watch:

"School of whale abaft the starboard bow!"

And that was a signal for action.

The decks were gotten into condition, even before the vessel was turned and headed for the spouting mammals to the right of it. Cameras were set. The double was placed in position, with the harpoon rope coiled and in neat readiness for his leap. Stripped to a minimum of clothing, he stood awaiting the opportune moment.

Everyone was tense. It was the second for which they had waited. A brief interval of extreme excitement and they hoped that they would have the "shot" which would spell their return to the U. S. Added to this natural feeling was one of concern for the double. What would happen if he missed striking the spot and should be thrown and beaten as the animal floundered away? Or what would happen when he did strike the thing?

The question of doubt did not linger long in their minds. Quite abruptly, and before they were within what they thought the bounds of the big school, one whale suddenly appeared so close to the side of the boat that it almost struck it. Then amid the excitement on deck and the huge waves that the mammal naturally caused, a little drama was enacted.

The stunt man stood there as if petrified. He did not make one move to go overboard, but instead backed away, pale and evidently half scared to death. Of course no one

could really blame him. The monster had arisen with such terrifying suddenness, and apparently without the slightest fear of those on board, that it was really cause for anyone to think twice before leaping on top of it. Again, this was an exceptionally large specimen, at least eighty feet. But these things a stunt man should not think of—or he should think of them before his employers take him into the unknown waters of the Pacific.

The director was wildly hollering for him to jump, the camera men were still grinding, and the personnel of the troupe were excitedly running from one place to another. But still he stood there—and dropped the harpoon.

A man's body was seen to leap at the weapon. Just a bare second he hesitated, then without touching the sides of the ship he was overboard. It was Red Thompson!

He landed squarely on the back of the fleeing whale, just behind its head, and in almost the same second and motion his arms descended with the instrument of death. That whale must have gotten the shock of its life. At any rate, it whipped the water a couple of times angrily with its broad flat tail and sounded.

Everyone had expected Red to let go as soon as the harpoon was buried in the animal's head, but no—he went under still clinging to the rope. And when the mammal came to the surface a few seconds later the stunt man lunged again, pressing the spear (which was already in and impossible to withdraw) further into the huge head and into the brain. Even then he did not leave. For long minutes he fought, just a small object on the back of the

giant of the sea, and soon the thing ceased its struggles and was drawn to the ship.

Red was helped aboard, and of course there's no need to say that from then until the ship landed he was the hero of the boat. His action had been sudden and entirely uncalled for. He had saved the company valuable time, and incidentally had gotten a better thrill than they had dared hope for.

So that's how he took a little rest from stunts.

But while Red was in the South Seas for pastime things were not going so slow for us at home. In the first place, Wesley May, one of the most daring and at the same time one of the cleverest of parachute jumpers and aërial gymnasts, had successfully climbed out on the motor of Earl Dougherty's ship and had actually whirled the propeller after it had stopped in the air. It was one of the finest exhibitions of stunt technique ever to be photographed.

Yet Wes went up to make a parachute jump near San Francisco some time later and the unusual happened to him. He made the leap with the same precision which he always exhibited, but he landed in the top of a tree in a graveyard and fell onto a tombstone. That killed him.

With me life was most uneventful. I made a couple of slips, but neither of them amounted to anything. One occurred while I was making a jump of thirteen feet between two nine-story buildings. I was to run along a fire wall about two feet wide and when I came to the gap I was to jump, clear the intervening space, and land on the wall of the building opposite.

That was not difficult. Almost anyone could broad jump

thirteen feet, so I imagined that this was going to be just a pastime.

I got in position, and as usual never focussed my eyes on the spot where I intended to land until the order came from the director to go. Then, digging my toes in, I sprinted for the gap. When just about to reach the end of the building someone yelled:

“Stop!”

Well, for some reason I tried to before I came to the sheer drop of nine stories, and when I was just a step from the edge I realized that I had made a mistake. It couldn't be done. Giving all the strength I had to that one last step, I sprang forward. But there is a great difference between a running broad jump of thirteen feet and a standing one. At least it would be almost a jump from a standing position.

Instinctively, when I came to the edge of the other building I did not try to land on my feet, but lunged head first, and this probably saved my life. I hit with just my arms and part of my chest on the very edge, with not enough leverage to pull myself up. Still, I had a good enough hold to keep me from falling. It was then but a few seconds until I wriggled myself completely up on the other side, and gave one quick glance at a spot where I darn near landed—on a cement street a hundred feet below.

That was once when I had a perfect right to call my hand, and what I told the person who tried to stop me in the middle of a stunt I don't think anyone would believe. However, after I had cooled down somewhat we did it over, and this time I had no vocal interference whatsoever.

Shortly after this I went with a small states' rights picture company under what was supposed to be a long-term starring contract. Several times previously I had had such opportunities, but because I did not like to get away from the stability of established concerns I had refused.

However, I was persuaded that I could never amount to anything by always being a double and a stunt man, and I finally accepted an offer from the Scharlin-Taylor Productions. And I must say that as far as the Scharlins were concerned they were not only good employers to me but also very good friends. I think I did more stunts for them in a few days than I had been used to doing for big companies in a month. But I liked it because I had everything to say as to how and where they were to be performed.

While we were between pictures I was given permission to stunt for other concerns. So I took a contract to wreck an automobile over a cliff. This is where I made the second slip. All I was supposed to do was to stay in the seat of the car until the front wheels left the incline. Then it was up to me to jump. But again it was proved to me that stunt men are liable to make mistakes.

Just as the car was ready to go over, when the wheels were on the very edge, I found that my departure was somewhat tardy, so I had to stay with the thing while it made its various gyrations. I did have sense enough to get down on the floorboards and hold to the steering post, which saved me from severe injury. Nevertheless, when they pulled me out some two hundred feet from the starting point I had a broken right wrist and two broken ribs,

besides a gash over the right eye which cost me a few stitches.

That rather forced me to ease down a bit—particularly the wrist. Ribs heal comparatively fast, but a wrist? I'd rather have an arm broken any time. And during these rest periods I always got a chance to visit my friends, whom I usually neglected while on the job.

I went out to see Bud Creeth, to talk over a few of our old plans and some that weren't quite so old. When I got to the field he and Murphy, the famous race driver, had just come down from a hop. They noticed that I was bandaged and naturally inquired how it happened. I explained. Bud laughed and, turning to me, said, "Well, you'll get it first, then this race driver will go—but as for me I'm going to fly long and straight."

There's a peculiar thing about that statement. Murphy was killed very shortly afterward when he went through a fence in a race that I believe was held at Altoona, Pennsylvania.

And not a great while later Bud was testing a new type of ship not properly designed and constructed. He had flown it about thirty times and it acted perfectly under control; but at best it was considered somewhat of a freak. Suddenly one aileron was seen to crumple when he was five hundred feet in the air, and the thing just about did a barrel roll. . . . Bud got his. He was dead the minute he hit.

Poor Bud! And he was the one who was going to fly long and straight. He who had reached over with one long arm and given me a new lease on life. Well, I suppose I

should have known that he, like all the rest of my near friends, would join that ever-growing Squadron of Death, but I didn't think that he'd get to it before me.

We were feeling pretty low the night that happened as we gathered, the few who were left of the old gang. Now there were but Red Thompson, Pauly Malvern, Duke Green, Bob Rose. I had lost just about all who had become real friends. There was Gene Perkins, but Gene was married and that made a difference. He was usually home with the wife and babies.

Gene and Pauly were working on a picture which required many and various stunts, so naturally they were pretty well worn out at the end of a day's work.

Shortly after this Gene and Pauly came to me and wanted me to do the flying for a stunt in which they both figured. Pauly was to be on the top of a passenger train; Gene on the end of a rope ladder. They wanted me to fly over the train, get into position, and drop Gene to Pauly. Then they would put on a fight on top of the coach. Of course Pauly was really there to help Gene land safely.

I put in a bid for the work, but my price seemed far in excess of the studio's pocketbook, so another pilot was engaged, one who had had little experience with making changes from airplane to train, or airplane to airplane. Of course we all knew that the element of danger to the man on the ladder was materially increased by such methods. But what can a studio do when a man guarantees his work? They could not know that the low price this man offered them was an expression of amateurishness.

Perhaps there are those who will think that this is just

an indication of narrowness because I did not get the flying. But I really don't think that anyone either in flying or in stunts will ever say that I regretted losing a job. I am more or less fatalistic about those things; I never push myself for any stunt. I would rather have them offered to me than to go after them, and I never seem to be idle very long. So I wished the pilot the best of success.

They went on location at Riverside, California, and everything was prepared in accordance with Gene's wishes as well as those of the pilot. The particular stretch of track had been selected, and the train stood ready to make its dash. The rope ladder was attached to the airplane and hung in its proper place so as to be out of the way of the landing carriage on the take-off.

The signal was given and they were off. As had been previously arranged, the plane circled the train and got into position. The train put on full steam as the airplane tried to swing into position. Twice they skidded over the telephone wires that bordered the track. The pilot was not approaching directly from behind. On the third try Gene was on the lowermost rung of the ladder. A very dangerous position, since if his strength gave out he would be helpless to climb the rope to safety.

It may have been his added length to the rope ladder. It may have been a mean cross wind. Or it may have been just a misjudgment of distance. But from whatever cause, as they passed over the wires and then dipped down toward the speeding train, Gene's body was flung against the side of a coach.

Pauly Malvern was waiting on top, helpless. He could

do nothing. He watched the ship slide over the train, just a little bit above it. He watched Gene at his arm's length. Evidently the side swipe which he had received hurt him. He hung almost limp in the wind resistance at the bottom of the ladder. Certainly he must have broken some ribs. Once or twice he could be seen endeavoring to make a rung. But the efforts were futile. He did not even pull himself out of the full-length position. Pauly from the train top saw him shake his head in hopeless negation. He knew that the other's efforts were unavailing. There was but one thing for Gene to do—and he did it!

No sooner had he left the bottom of the rope ladder than Malvern jumped from the train—from the top of a passenger train making fifty miles an hour! But they were buddies; they had been the closest of friends for years. And when Gene shook his head Paul knew.

They hit the ground about the same time, Pauly rolling over several times and coming at once to his feet—unhurt.

Gene lay where he hit. He was not dead, but terrifically injured. He had landed on his feet, true to his wonderful instinct of body control in the air—but what difference did it make? No one can fall five feet from the bottom of an airplane in full flight and live. At least no one has.

But after a fall of approximately fifty feet it seems incredible that he was alive at all. His leg bones had pierced the heels of his shoes, and then some. He was injured internally, still he was conscious.

"I—I couldn't hold on any longer, Paul," he said, and then lapsed into unconsciousness.

Of course it took the train some time to stop. It took the

troupe some time to get to the spot where Gene lay. Now I can understand why Pauly jumped. He was there to get that message.

Gene was rushed to a hospital immediately. He still lived. What exceptional vitality! What power of body and mind to hold together in such a broken condition! To fall from the ladder of a ship and live to say a few conscious words.

Those few dear ones gathered around, and either the day before Christmas or Christmas day Gene opened his eyes and endeavored to smile. It was a pitiful attempt, but it was there. In a weak voice he murmured:

"Don't worry. I'll be all right—in a few days." And he joined, too!

XXII

MORE OR LESS LUCK AND A VACATION

THE period which followed Perkins's death was an unfortunate one. One of my mechanics, Jimmie Barton, was cranking the propeller on a ship in which I was about to take the air. Just before I started, after the motor was warmed and revved, he held up his hand to keep me from starting and pointed to the tire. Evidently it lacked air pressure. He put his weight on the wing and then raised up, perhaps to see if a slight bounce was sufficient to blow it out on the landing.

The motor was turning about six hundred. I shook my head negatively, certainly this would prove no test. If it needed air it should be put in then, as it would take but a few minutes. He paid no attention to my nod, and I was shutting off the motor when a peculiar thing happened. He staggered back from the wing of the ship as if shot. Blood spurted in a stream from his throat. It was not as a person ordinarily bleeds from a cut, but in throbs that sent it inches past his chest.

Even as I cut the switch and ran to him I knew what had happened. As he dipped the wing it brought the propeller close enough to the sandy ground to pick up a

pebble, which it hurled with bullet-like velocity toward him. No expert marksman could have aimed with more precision.

I grabbed him by the throat, clapping my hand tightly over the hole. Then with the aid of others on the field I rushed him to an emergency hospital.

No one dreamed that his life could be saved, for everyone was sure that his jugular vein had been severed, but when a medical examination was given him it was found that the stone had lodged itself just one sixteenth of an inch from that important connection to life. However, he still bears a scar from the experience, and when I saw him a few months ago he said that two years later they removed another pebble which they had overlooked. He also told me that he had never tested airplane tires in that way again.

The next thing I heard was that Gladys Roy had been thrown from a horse during the making of a thriller and had broken her leg and injured her back. Gladys was evidently not as good with horses as she was with parachutes, for at this time she held the women's world record for altitude jumps.

Poor Gladys! When she did get well she finished the picture and then went back to her old game. It was one with which she was entirely familiar. She had been around airplanes for some years. Yet she stepped from the cockpit of a ship, over the leading edge of the lower wing, and walked right into the propeller! No need to say that she was instantly killed.

It is a peculiar thing that even some who are familiar with the danger that accompanies a twirling blade are

killed. This is easily accounted for, because those who work around airplanes get careless or forget, while those who are ignorant of this peril never know until it is too late—if they do then.

And just about this time I almost got mine while I was walking wings; or rather climbing underneath them. I was hanging to the wing skid. The skids on that ship were semi-elliptical pieces of bamboo, placed under the lower panels at the outer end of their span to prevent the tips from being injured should the wing drag on a landing.

We were doing our stuff like no one's business. I would hang by my knees, hand, or anything that came handy. Finally I decided that we had performed enough and was just at the point of climbing to the top of the wing when the rear end of the bamboo gave way. Luckily I was at the front, with only my legs wrapped around the broken part. But should I have been in reverse position I probably wouldn't have had time to recover from my surprise before I hit. As it was, it let me down with such suddenness that I didn't at first get wise to the real condition of things. But when I did, do you think it took me long to ease my way to the strut above? Would a fox stop to scratch a bite if he had a hound after him?

But then my good breaks have kept me alive. Parachute jumpers, high divers, wing walkers, race drivers, and daring pilots are all placed in the big hangar of this Squadron of Death. The Old Man with his scythe is not particular and mows most of us down sooner or later—some sooner. He figures that the law of averages is against some hazards more than others, and consequently he picks his teeth

on the bones of those who attempt them more frequently than he does on the bones of conservative ones in our clan.

So he picked on Shorty Osborn. Shorty had done every kind of parachute jump imaginable, even to making several attempts at breaking the record of falling before pulling the ring. So in looking for newer and greater thrills he happened to pass the Palisades at Santa Monica. These cliffs border the Pacific Ocean and rise perpendicularly some three hundred feet into the air. At their base is a bed of hard sand and granite, at the top a comparatively level stretch of parkway, fringed at intervals with palm trees.

He stopped. Here was a new one. Why wouldn't it be possible to make a parachute jump from this spot? A smooth runway could be built, even planked, to the very edge of the cliff. Then he would strap on a back pack and mount a powerful motorcycle. With a sufficient run, the 'chute ought to open—especially if he pulled the ring a few feet before he reached the cliff's edge.

He took in every little detail: the proper amount of space required for the run, an actual measurement of the Palisades at their highest point, and his probable landing spot.

The thing was all set, and it was no small crowd that gathered to see this most unusual exhibition of the dare-devil. Cameras were set below at the foot, in position to catch the motorcycle and its rider from the time they left the cliff until Shorty left the motorcycle and floated easily to the sand.

Never once did the determined face give an inkling that

its owner felt the least doubt of the final outcome. As Osborn strapped the parachute he was smiling. Then he straddled the 'cycle and declared himself ready.

At a thrust of his foot the machine bellowed forth its sharp staccato notes. He surveyed the stunt just once, then shoved the motorcycle into gear. With a push he was on his way. He gained terrific speed in the short spurt and when but a few feet from the edge of the cliff took the necessary position to make an immediate getaway from the piece of machinery that was carrying him. Suddenly the pack opened and out floated the long white 'chute. Somehow or other it looked like a shroud as the man and 'cycle leaped the cliff with it in their wake.

I think we'll drop the curtain on that quick descent. At least we will make but a brief story of it. He left the cliff. The parachute trailed. It fluttered in the wind. It did not open. The man did not leave the motorcycle. All three landed on high-tension wires—and broke them. Then they hit the ground. The man got the worst of it.

But that short story tells of misery. It leaves to the imagination how the body was broken and crushed. The legs were splintered in a dozen places, and the bones overlapped grotesquely. Again those old familiar words: "He was rushed to the nearest hospital." Nobody—even doctors—thought he had a chance to live. Spectators could not imagine a life surviving a fall from such a height. The doctors could not believe it, judging from a medical point of view. But the bones were all set. And in time Shorty opened his eyes and regained consciousness. More than

that, he struggled through all the pain of coming back, of living. And he still lives, though he lost some two inches in height because of the necessary overlapping of the bones where the legs were fractured.

After Shorty had his narrow escape from death an Indian chief declared that he could hang by his hair. It sounded unbelievable, but the cameras were gotten out and dusted and Art Goebel was engaged to fly him. Long before this Art had established himself as one of the greatest stunt pilots on the coast. He had worked with me on several jobs, including the states' rights pictures, and with Frank Tomick had flown for the changes from airplane to airplane which we made for this company. So the necessary equipment was arranged and the chief's hair was tied to a rope.

Well, everyone was very much surprised. The Indian did just what he said he would do! At an elevation of fifteen hundred feet he crawled to his position and slowly let himself hang by the roots of his hair. Then he swung his arms free, while his body dangled in space.

But this was not enough for the red man; he wanted to try parachutes—not one, but ten. In other words, he expressed a desire to use ten parachutes in making a descent from five thousand feet. His idea was to fasten them all to him and then jump. After the first parachute opened he would cut loose and open another. So on until he had freed himself from nine and opened the tenth.

He was flown to the desired altitude and he jumped. Successfully he cut loose from three, but forgot to look at the ground often enough, and on the fourth, which had not

time to open, he hit and lay very still after bouncing twice.

The chief was not with us long. I wonder if the boys let him join the Squadron of Death?

It is my firm belief that many of these things should be regulated. At the present time I never cross the centre of a big city because the height necessary for safety to a landing place is not an economy of money nor of time. In the last five years I have never stunted except as part of my work.

Not many years past it was a dare to take a ride in a ship, and it was still quite an achievement to fly one. A cloud of romance hung about the dare-devilishness of such an unusual accomplishment. What a laughable thing that is to think of now!

The sudden flooding of the market with cheap war leftovers made this phase pass. No more were people attracted by the mere sight of a ship; indeed they hardly noticed the loops, barrel rolls, and tailspins of those more theatrically inclined. Thus we passed into another period, that of jumping from airplane to airplane. And following this were others, such as crashing airplanes intentionally, long ocean flights, refuelling in mid air. All of these different stages had their effect, some for good, others not. But in a small way those of us who have stunted and barnstormed have kept the public slightly curious about our game.

Furthermore, we almost had to do the spectacular to keep the public interested. Most of our rudely constructed fields were financial flops and the pilots always about half starved—or would have been if it were not for some of our

silly stunts. It was hard to get many outside people interested in flying, and courses of instruction went begging at a hundred dollars.

We needed some impetus to change it from a game to a profession, and that impetus was given to this country in a great measure by Colonel Lindbergh. After his remarkable flight people seemed to sense the possibilities that lay behind this new mode of transportation. It was definitely recognized as another means of travel, with the result that now our fields are rapidly becoming known as business centres, with a network of air lines covering our entire nation. The dream of all old-time pilots!

To the unceasing work of our progressive Department of Commerce belongs a great share of the credit. It has regulated fields and pilots, created new standards of construction and discarded the old. The entire country is spanned by beacons and revolving lights. Many necessary restrictions were ordered, such as condemning the old and dangerous surplus war stock. But long before the department took control the principles which it now stands for were in the minds of those of us who had been with the *game* (and it was a game) a few years. Only we did not know how to get that regulation. Then we resorted to municipal and finally state legislation.

Now the old habit of stunting is passing into the discard and rightfully so. It has no place in the established industry, except for military and naval manœuvres. There it should stay. I believe that sooner or later we will find strict laws governing this sort of thing. New and improved ships will make any stunt avoidable, therefore unnecessary. But

the game had to go on. Thrills were wanted for pictures.

Warner Brothers called me for a stunt. Perhaps I forgot to say that this company was no longer small. It had struggled and had worked, and, while large companies had ignored it, it had gotten a firm hold. When it blossomed out everyone looked!

Anyway, the thing which I was to do this time was nothing at all. Doubling for the star, I was to walk along a trestle, over which one of the fast trains ran. With me, also doubling a principal of the cast, was Al Mazola. We were to let the train approach until it was so close that it would be impossible for us to reach the end of the trestle. Then in final desperation we were to throw ourselves over the side and hang just below the ties while it passed above our heads.

Huh! Things never seemed to work out quite as I planned. We were on the track all right when the train started over the trestle, and we were walking, just as we had been told to do. But a train travelling as fast as a limited does, between fifty and sixty miles an hour, does not take long to catch up with a couple of doubles travelling on two legs. Of course we ran, and when the front of that engine was about two hundred feet behind us we started looking for places.

Have you ever been in an automobile travelling along at a fair rate of speed and have it pass fairly close to a high wooden picket fence? Somehow or other every piece of wood is blurred into the next. That's exactly what happened then. Every one of those railroad ties lost its indi-

viduality! Of course I'd have to pick one that wasn't there at all, and I stumbled. More than that, I went down—flat on my face. *What* an embarrassing position!

It didn't take much instinct for me to know that I wasn't going to be able to get to my feet and run to the side of that trestle in time to avoid a collision with that engine. It didn't take me long to decide that I had to do something. So I did it. Half rising to my feet, I leaped into the air, hoping to get out of the way of the cow catcher and the wheels. Well, that was a long second, but I partially won. The front of the engine missed me. That is, those parts which I wished would, did. But the piston caught me and completely knocked me off my balance.

At least I was out of its way, and at the same time I had managed to catch a tie. Then I began to wonder, as the wheels were passing over my head, just where Al Mazola was. When I looked to my right you can imagine my surprise to find him hanging right next to me.

The stunt was all right, but I felt the sting of that impact for several days. So when we got back to Hollywood I decided to take a rest. After all, I'd been hitting the pace pretty hard myself, and thought that a few days up in some mountains would do me good. That night when I saw Georgie Smith I asked her if she and her mother would like to accompany me. She didn't think that her mother would, but as for herself she thought that she might. Of course I insisted strenuously that her mother ought to go along to chaperon—and this won the argument. Georgie would go alone.

So she packed her suitcase. I packed mine. And we got

into the car and headed for the ship. When she saw what I was about she looked at me dubiously.

"Didn't you say that this was to be a vacation?" she questioned.

"Yeh," I answered in perfect American.

"Then why bother to take the bus? Let's go in the car."

I finally persuaded her that where I was going would take half of the time for our vacation if we went by automobile, and she was just game enough to accept my viewpoint.

We flew to the Santa Cruz Mountains—up to the home of friends who had been kind to me after I had made that spectacular and unexpected crash for Tom Mix. They were old-fashioned Germans who had lived in those rugged redwoods during the greater part of their lives; an elderly couple still romantically happy in their declining years.

And why shouldn't they be? Their little farm was their own. Just a garden spot in God's scheme of things. Rugged mountains arose on all sides, clothed in the grandeur of the majestic redwoods, trees which seemed to whisper secrets of the ages to those who would listen. Their very fragrance seemed to create an atmosphere of contentment and peace. A mountain stream sparkling in the golden rays of the sun murmured its way in and out among them, passing so close to the house that one could stand on the moss-covered veranda and watch the mountain trout dart quickly about in the icy water. In the small clearing one could see the vineyard, from which came the grapes that supplied the

excellent table wine. What a change from the nervous tension of stunts and the excitement of the city!

Every evening Georgie and I would sit together and watch the water go bubbling, singing on its way. We watched the shadows grow longer with the sinking of the sun behind the wilderness of the trees, and we watched the moon rise and watch over things of the night. Long after the last grunt from the pigs and the last "moo" of the cows we were still watching.

The splendor of the scene and the warm August breezes must have hypnotized us. We breathed and lived that Nature with which we were surrounded. I made vows which I never knew existed. So did she. And usually in the midst of all this romantic talk out would pop our little German mother and drag her off to bed.

XXIII

A CRACK-UP ENGINEER

FLYING home from that vacation with Georgie Smith I had lots to think about.

Was it right for me to take an innocent girl from a care-free life and drag her into an existence which would prove to be one of ceaseless worry? She had told of her reactions while watching that fire dive at Fox, and at that time we hadn't even met. What would her feelings be if, loving me, she should see these things done? I wondered how she would act if she saw me injured or killed.

Then, too, I thought of my possible reaction to marriage. I'd always have to be thinking of the girl and I'd always say to myself, "Well, you've *got* to come out of this stunt! You don't dare go to the hospital!" An attitude like that is the very one which sends you there, because it shows that you're worrying, and worry is not conducive to the calmness needed in stunts. For my own protection I must be a care-free stunt man, rather serious at times but never thinking or caring whether I go to the hospital or not.

Inwardly, however, I am serious, and carefully weigh the chances I take in a logical and mathematical way. That, I believe, is the reason why one director said to me:

"You're no stunt man. You're really a crack-up engineer." He could not know that I had taken my mathematics seriously when in college.

However, I had not saved any money, for I am not a good business man in that respect, so the most I ever had was a few thousand at a time, and money would be necessary with this. It was not unnatural then that my mind should be puzzled with this maze of disquieting thoughts.

Was this game, then, to rob me of the greatest thing in life? Would I always have to be just a stunt man without thought of a family and a home? Must I be a man grown to maturity with nothing to look forward to but stunts?

Yet I had all of the instincts of other men. I wanted to love and to be loved. I wanted my laughs, and I surely got my heartaches. I had my likes and dislikes, though I had not the power to hate. I guess I realized then that I could have almost anything but the woman I loved.

If I quit? I laughed. I could do that. If I stood by my desire it meant a life of torture to her and maybe, just a maybe, my desire to be careful for her sake might make me yellow. That seemed improbable, impossible—the thought of being a quitter, a coward! Yet . . .

I landed at the field and got out. I was back after the first vacation since coming to Hollywood. I was back as a stunt man, and the romance which had held me was gone. There, the mountains with its redwoods and its streams; here, the city with its business and its traffic. There, play; here, work.

So I went to work. When I got home after taking Georgie from the field I found a hurry-up call from Mal

St. Claire asking me to report to him as soon as I got back from my vacation.

After getting in touch with the company I found that they wanted me to crash a rowboat on the rocks at Laguna Beach, and that they wanted it that same afternoon. The only way I could get there was to fly, so I went back to the field and forty minutes later was hovering above the cliffs for a landing place. I saw but one small level piece of ground, and it was only about two hundred feet long, but I finally plopped the ship in it, though I broke a tail skid in turning to avoid going over the cliff at the opposite end.

I was rushed immediately into the double's clothes and given a rowboat instead of an airplane, which after several attempts I managed to ride upright through the breakers and near the spot where I was to do the crash into the rocks. The breakers at this point did not look any too inviting as they splashed away at the mussel-covered boulders, but I knew that by leaving the boat as it was being carried over on its back I would be comparatively safe. And I was.

One big wave rolled under the small craft, lifting it high into the air. Then as the boat was carried along by it, I found myself following out my plan of action. I climbed to the prow and had just enough time to start my dive when the thing turned completely over. A little fight with the rocks and I swam out.

I was ready to go back to Hollywood, but on account of the minor repairs which had to be performed on my ship it was impossible to leave that evening; and I was not sorry as it had been a more or less strenuous day.

So I was given a room with an assistant camera man. His work was not easy, either, having to lug the camera paraphernalia around all day, so very early in the evening we piled into our respective beds. While we were lying there, naturally some conversation followed. He asked me about my past: how I happened to get forced into stunts and why I took the chances I did for such a small return.

Naturally, I took a similar interest in him. I wondered just what his tale of life had been, and what his ambitions were. First he told me nothing. He answered questions which required a "yes" or a "no," but beyond that nothing. Then, just as I was going to give up, he opened up.

For three years before he got his first job in pictures he had been a "stick-up" artist! Well, when he told me that I got the biggest thrills of my lifetime. A man I had known for almost two years, and one who looked like a youngster just out of college, a criminal! At the time I wondered if the couple of hundred dollars that I had in my trouser pockets would be there in the morning. Upon further inquiry he told me that the most he ever got from any of his jobs was eighty dollars, and quite frequently he got no more than two to five.

For a man to risk his freedom, his citizenship, and his honor for such meagre returns seemed very foolish to me, and I knew that I'd rather take my chances in another way. However, he told me that since he had taken his job with pictures he had gone straight, that he had turned over a new leaf, and that he had never held up anyone—unless the studio gave him a layoff! I didn't sleep so well that night.

By the next day the tail skid of my ship was repaired and I flew back to the field.

Shortly after getting to my little home I was resting in a comfortable Turkish rocker thinking over the life of excitement which I had been leading lately and of the various thrills in which I had participated. What would the logical end of it all be? As I sat there I realized one thing. I had enough aviation work to keep me busy without taking on stunts of any other nature. Why, then, did I not confine myself to just this one field? There was no necessity for doing the many and varied thrills to which I had accustomed myself. So I made another rule. There should be nothing but aviation in my life henceforth.

Even as I was thus thinking the telephone rang. It was Billy Wellman at the Paramount Studios, and he wanted to see me immediately.

His rise had been phenomenal since the days when he worked at Fox as assistant director for Bernard Durning. After Durning had completed *The Eleventh Hour* he had taken the picture to New York, and it was while he was there that he contracted pneumonia, from which he died. That threw us all for the loss, but I think no one felt it more keenly than Bill. But it did not stop his climb toward success, for he had directed a couple of pictures for the Fox Company and several for Paramount.

When I got to the studio I paused outside of a door that read "William Wellman, Director" just long enough to realize that Bill had been wise in his move to give up aviation after his thrilling and spectacular war experiences, and then I popped in. A few minutes later I was

shown into his private office, where we gassed over old times in general, and some of my stunts in particular. Then he said:

"How's your flying these days?"

"Well," I answered, "I'm still making a few hot landings."

"Then listen," he continued. "I don't want you to give me an answer until you've heard everything I want. Nor do I want your answer until you've considered fully just exactly what you will have to do. And if you think the stunts I propose are impossible, that they can't be successfully done, I want you to tell me so candidly."

I listened. This began to sound interesting.

"They have given me a big air special to do. It is to be called *Wings*. I hope it will be more or less of a history of the war from the air, therefore it must be realistic. In order for it to be all that I want it will be absolutely necessary for me to have several intentional crashes. That is the reason I called you. I know that when you say you will do a stunt you will do it."

For no particular reason I thought of that first stunt for motion pictures, when I was so startled at the director's command that I fell the fully forty feet to the net, and I had to smile in reminiscence. Many hundreds of stunts had passed into and out of my hands since.

"What I want from you," Wellman continued, "are those crashes. They are not easy. I believe that they are the hardest crack-ups that will ever come to you. I don't believe as long as you continue you will be up against any that are more difficult.

"I'm not trying to scare you, but you know as well as I the danger of crashing the old S. P. A. D. That's to be the first one. And it's not just a regular crack-up, for it will have to be a dead stick landing in No Man's Land. And I mean No Man's Land. It will be just as true to life as it was over there—barbed-wire entanglements, machine-gun nests, shell holes, and all the rest of it. More than that, this is a motion picture. It becomes more difficult than actually crashing in war time because you have to land with respect for the cameras. I want the ship to end up on its back, not over fifty feet from the nearest camera."

He looked me over closely, and I know that he was wondering inwardly just what effect this description would have on me. But unlike actors, stunt men have a habit of concealing their innermost feelings. It is necessary to their work and it becomes a habit with them to use it in everyday life.

"What speed does a Spad make?" he asked, though I knew that Bill knew, for he was with a unit which had used them.

"Depends on the motor," I said.

"I think that these have 180 Hisso's," he said.

"Then they should make a little over a hundred and thirty," I answered.

"Well, you know what you're up against in that one, and if you think you have done any other to equal it, it would ease my mind to hear it. But that is just a beginning. We have three and possibly four similar hazards. The second is to crash a Gotha bomber into a building,

although under what circumstances we have not yet decided, and the third will be to crash a D-7 Fokker, with a two-hundred-horse Liberty, into the ground shortly after it takes to the air. Perhaps you realize the speed necessary to put one of these German scout ships in the dust under such circumstances."

I did. Moreover, I realized that the job which he was handing me was the toughest one in my entire career of stunting and of flying.

"And the fourth stunt you are not yet decided about?" I asked.

"That will come later, but these three are the important ones. Now, Dick, I've given you something to think about. When you've made up your mind, when you've considered every angle and every risk, come back and give me your answer. There is no rush. All I want you to do is to give me a 'yes' or a 'no,' and if it's 'no' I won't blame you."

"Well, I wouldn't blame myself, either," I said, "but if I decide to take them can I arrange the order in which to do these things?"

"Certainly," the director answered, "but why that question?"

"You see," I said, "I'd like to fix it so that the easiest comes first, then follow with those that I consider are the more hazardous, leaving the most difficult to the very last."

"Arrange them to suit yourself. We will fix the shooting schedule to conform more or less to your wants."

I got up to leave. Knowing what was expected of me,

I had a lot of thinking to do before signing my name on the dotted line.

When home I tried to figure just what the chances of escaping were. I got the technical data on each one of the ships so that there would be no miscalculation. I even went into the construction of them all and planned how to brace the Spad, which had a wooden fuselage, and where to weaken the Fokker, which was constructed of steel tubing. The latter, I knew, would have to have either the struts or the wing beams sawed. It was so well made that I might not get enough dissipation of forces as I bumped a wing or hit the undercarriage or bored into the ground with the nose.

But the more I figured the fewer conclusions I arrived at. I must see the actual conditions under which each one was to be done before I could tell just how hazardous the whole thing was.

Again, the characteristics of each of the different types of ships entered into my calculations. I would have to fly every one of them and become acquainted with them before I could tell just what could be done with each. It has been my observation that you can take two ships of identical make, having the same power plant, and apparently rigged in the same way, yet one will be a real pleasure to fly and the other just a labor.

Of one thing I was sure: the arrangement of the stunts should be mine. There was no psychology in this; just common sense. By doing the one which seemed the easier (if any of them did at this time) first, it would insure both the company and myself of the second one, whereas if I was

injured on the first severely enough to send me to the hospital then the picture would be shy a thrill, and so would I.

In a way it was another of those blind chances. The thrills might be extremely hard to do. They might even be impossible. On the other hand, I might walk out of them without a scratch.

Indecision and inability to solve the actual problems made me realize again that we are not our masters. Fate and the Great One are ever present. So literally I threw up the sponge, or tossed a coin, or something.

I took the receiver from the hook and got my number. A few seconds later I was talking to Bill Wellman.

"Hello, Bill, Dick Grace talking. I think I've figured those stunts over enough. I'll take the job."

And that settled that.

XXIV

. . . AND THEN THEY FINISHED THEIR PINOCHLE GAME

ONE of the most important items in connection with crashing airplanes is a contract. In this instance this was mere form. Not the general form, but that which it has been my lot to sign. It contained the usual liability clause—releasing the company from any claims that my “heirs, descendants, or assigns” might have in case of a fatality. Of course, I was guaranteed hospital care and funeral expenses, and besides I came under the workingman’s compensation law which allows \$5,000 for death and lesser amounts for permanent injury. However, subsequent events proved that a contract does not always mean so much, for they showed a generosity not usually found in industries which employ thousands of people.

The order of the crack-ups was inserted at my request, the terms stated, and the signatures attached. As I was signing I wondered just a little bit what this contract would involve and I think, even at that, had I known I’d have put my X on it anyway.

I was told that I might be gone on location at Kelly Field, San Antonio, anywhere from three to six months,

so I very wisely packed all of my belongings, labelled them properly, and put them in storage. After I had sold my car I felt perfectly footloose. Nothing that could possibly happen would fool me now.

On September 6th we boarded a couple of special trains and started on our journey to make *Wings*. Perhaps my feelings, as I saw all the old landmarks pass by, were not those of the rest of the troupe. Others could go on this location with freedom of mind. They could enjoy the change of cities and of companions for these few months. But for me there would be no peace of mind until the last crack-up. There was a heavy responsibility on my shoulders. I had to deliver satisfaction. I must produce results. And what a task had been given me!

I was not sorry that I had taken the job. I was happy that I now had more crack-ups to do, but I was worried as to the outcome. What if I should overshoot the mark? Then the shot would be a failure, a ship would be ruined, and I might injure or kill some of those who were expecting me to land as directed. But it was easy to throw off this last possibility. I know that any ship whose stick I hold will *go when I say* as long as its controls hold together. And any ship that was supposed to crash in at a given spot would certainly go in there. These are things in which I have the entire argument to myself.

San Antonio met us with its best brass band. The mayor was there with other city officials and had most of the cars of the fire and police department to take the company to the St. Anthony Hotel. But being only a stunt man I grabbed me a taxi. I never cared an awful lot about receptions in

the first place, and I wasn't much of an outstanding figure among that array of stars and cast in the second.

Then after the liberal hospitality of the South was enjoyed for a few days, work began for me in earnest. I went to Kelly Field and watched my ships being unloaded. There were two Fokkers and two Spads. They were placed in Hangar No. 2, which eventually became a work and repair shop for those planes which I was to use for the crashes. A ground crew was assigned to me to make the alterations which I thought were required for my work, and Frank Tomick was placed in charge of the ships.

But my hangar was not the only one which was busy. This was an army picture, that is, one portraying the aërial phases of the war from an army standpoint, and things were going along in the usual efficient army way.

Great squadrons of De Havilands were lined up ready to take off. Numerous Douglas O-2's were in readiness, and units of Martin bombers, cumbersome elephants of the air, could be heard droning overhead. A squadron of the latest type of fast pursuit ships (P-1's) were brought from Selfridge Field, near Detroit, Michigan, and camera ships were flown from Crissy Field in San Francisco. Twenty-four hangars full of ships would be used in making the picture *Wings*. The great majority of the army's aërial forces east of the Rockies were assembled here for this venture.

What a thrill, as those whole units took the air for review by the commanding general! Certainly no martial music, no honor that could be bestowed, could induce that feeling as one by one the squadrons of three's passed the

reviewing stands in perfect formation. There's something about the hum of one powerful motor that gets under your skin if you've been with the game any length of time. But when that sound increases to a roar that rattles the windows, as hundreds of them pass, then your heart just seems to open up enough to hold a whole Liberty motor.

I can't get a thrill out of a crack-up when it happens (though I do as I see it on the screen afterward) and I get no sensation out of flying, but just to watch a good formation of ships will give me a kick every time.

From the moment that I witnessed that review I was proud to be a small factor in the making of this picture. With such resources it could not fail. The labor, time, and money that such an undertaking required were stupendous. I was never connected with any production which was to be so enormous; one in which the individual played such a small part. The thing had to work as a machine, and where else could such a perfect one have been found as in the branch of the service that was to be pictured?

But I also had my work. One of my little Spads had been completely overhauled and rerigged. It was ready for a test. So I put on my helmet and goggles and got in the buzzard. It seemed good to me once more to get into this ship. It was so small that I could almost reach over and touch the radiator. Certainly for a crack-up it was a good thing that I was not exceptionally tall, for no man of six feet would be able to pull his head into the cockpit.

After testing it on the blocks I took off. I had been in the air but a few seconds when I realized that I liked this ship. Not only because it was a Spad—I liked that par-

ticular Spad. It controlled nicely, though it was somewhat logy. What Spad was not?

Immediately I felt a friendly attitude toward it. I liked its personality. So I proceeded to show it in my own way. I looped and spun it and did the usual book of tricks, and was just nicely over in a barrel roll when the motor coughed and died. It was rather embarrassing because I didn't think I was within gliding distance of the field. Spads are heavy, and glide like rocks. But I did manage to squeeze over the hangars and drop the tail skid over the starting line. Relief? Well, rather. It had not travelled more than a hundred feet after it was set down, so you can imagine that I had held it off as long as possible.

What can you say when a friend lets you down like that? Still, others who are my friends have dropped me much harder, so this wasn't a really tough break, even if it was on a first flight. Minor repairs were made, and from that time until it crashed never once did it give me trouble.

I did not have long to dwell on such small details as a motor konking. There were many revisions to be made before the little buzzard was ready for its death. Spads have a big gas tank situated directly under the feet, which feeds by pressure. I did not like this. If I should happen to go over on my back and the tank should break I'd be due for a bath of gasoline. Not that I mightn't need the bath, but I was thinking of the possibility of fire. So I wanted a small tank installed on the top wing which would feed the motor by gravity.

There were many other changes which would also take

considerable time. The linen had to be stripped from the fuselage that the longerons could be taped. And then as long as these last members were of wood I believed that a square arrangement of Shelby steel tubing was advisable at the top and bottom of the cockpit to keep it from collapsing at that important place. Lastly, I needed a new arrangement of the safety belts, for I had found that the one webbed one around the hips was no protection against hitting the instrument board with the head. This sudden bump is disconcerting at times, because it breaks the neck. We have found this out by close observation of crack-ups in this type of ship. Strangely, there is often no other injury, and no other mark on the body.

Besides these details, which progressed rapidly under the management of Harry Reynolds, there was the spot to pick and to prepare as well as the crew to select to protect me after the crack-up.

Billy Wellman, Lucian Hubbard—who was Famous Players' producer of *Wings*—Harry Reynolds, and I went out to look over the battle field.

Although I had been told that the company had had six hundred Mexicans working every day for a couple of months, it never dawned on me that it could be such an immense set. Almost as far as the eye could see the country was in a devastated condition. Shell holes twelve feet deep and three times that in diameter pitted the whole place, and as I saw them I made a mental note that I could just kiss myself good-bye if I ever struck in one of them. Barbed-wire entanglements were so realistic that it was with difficulty that we made our way through the tangled

mass. They were of real wire and the cedar posts were sunk two feet into the ground and protruded almost four above. My second mental reaction was to wonder what would happen to the ship and to me when we struck them. However, I was relieved when Bill said that a twenty-five-foot section would be built from balsam slabs, which are very light and break easily. Also, instead of wire on those posts we would have yarn or rope strung. It sounded good—if I could find the small section, travelling at least a hundred miles per hour and at the same time controlling the ship to a crack-up, which in itself is no mean job. Besides concerning myself with the technique of handling the stick, it was necessary for me to start an automatic camera, cut off my switch, close the throttle, turn off my gas tank, hit an exact spot, and protect myself. Protect? Well, when you smack the nose of an airplane at that rate of speed and stay with it, you haven't time to take any measures of precaution. The best safeguard is to do the stunt as you have it mathematically figured, and if you haven't struck a wrong balance nine times out of ten you'll pop up without a scratch. The tenth time I never let occur to me—when I get to nine I start all over again. It's the only sure way to beat that law of averages.

Anyway, the spot was picked. I was shown just where the cameras were to be placed, and ye gods! To make matters worse I had to head right into them. There were to be twenty-one grinding on the stunt. If I missed I knew that cinematographers' salaries would go up in Hollywood because I'd take half of them with me so they could photograph that Squadron of the Dead. Not only

that, but I noticed that the head camera man, Harvey Perry, had placed his parallel directly in line with the spot. That meant that I could not change my mind; that once I decided to do the dive it had to be a success. Half of the troupe would be grouped around that parallel and I knew that Bill Wellman and Lucian Hubbard, with other officials, would be on top of it.

I certainly hope that no one ever puts too much confidence in my ability to lay a ship where and how they want it.

After we left the war zone I put Harry Reynolds in charge of the rescue crew. The emergency fire apparatus of Kelly Field was given us for the stunt, and just for protection we decided to have three men with large extinguishers to rush in, should the ship catch fire. Ross Cook and Captain Campbell, the British ace, were in charge of the remainder of the detail. They were given ten men, each of whom had but one instrument of rescue. This was to avoid confusion should I be injured and pinned in the broken wreck. Included in the group was one with a four-foot pair of cutters, another with an ax, and still others with pliers, hammers, wood and hack saws, steel cutters, and hatchets.

That question settled, we turned to first-aid equipment, but this was quite simple. We had an army ambulance in charge of a regular physician; but as an added safeguard a hospital airplane was kept near at hand to rush me to the base hospital at Fort Sam Houston.

Final instructions were given to each one of these groups not to start any operations except at the command of

Wellman, who would signal Reynolds when it was safe to enter the crack-up zone. Also none was to enter it, except in case of fire, until the cameras stopped grinding. Even if I were seriously injured I figured that a few seconds would not make any difference one way or another, so why not get the shot for the picture? There was just one more little detail. If I was all right afterward I would kick the rudder of the ship. Then they would know that for this stunt, at least, I had not needed their help.

After all of these details had been attended to I again went to see how the alterations on the little Spad were progressing and was pleased to find that it would be ready for testing on the next afternoon. I wondered how it would fly with all of this extra equipment, such as cameras, storage batteries, and machine guns. Certainly it would be heavier than ever, for though the big gas tank and most of the instruments had been removed, quite a quantity of Shelby tubing had been added, as well as a head pad where the instruments were or had been.

Now everything was arranged. The crews were ready and the ship would be on the next day. All I had to do was to wait. But that waiting is nerve-racking, as I found out later. A week passed. I had tested the ship and had hangared it until I was given the word. In the meantime I organized a pinochle game with Frank Tomick and "Gunboat" Smith.

It was during this period that a certain event happened which had a psychological effect on me. One of the fliers tried to make a turn too quickly and lost his flying speed. He immediately crashed into the ground and was instantly

killed. The type of ship he was flying was not much faster than the one I was to crash. The nature of the ground into which he plunged was not as hazardous as hitting posts and shell holes. I began to wonder.

A couple of nights later we got together and proposed a toast to our departed comrade, and after we had drunk him on his way someone proposed that as long as I had a crack-up coming they should all have a drink to me. So we all drank me on my way, though I was present to wish them wrong. Lieutenants Cornelius and Thad Johnson were with us, and we decided that they ought to have a toast too, because they were flying the army P-1's which were supposed to shoot me down. They were both truly daring airmen and were instrumental in organizing the army's famous Three Musketeers, which later came to grief. Thad was killed after escorting Colonel Lindbergh on one of his trips, and Cornelius met his at San Diego, directly after an aerial exposition in Los Angeles.

But while we were having this last toast the telephone rang. It was Bill Wellman. He informed me that the crack-up would be the next day between eleven and twelve o'clock and to hold myself in readiness.

In readiness! I had been ready for weeks. However, that ended the toasts for that night. Now that I knew that it was just about to happen I could go to my suite and get a good night's sleep, and strangely enough I did. There was not a thought of what might happen on the morrow as I crawled into bed.

The morning was typical of Texas in September. A crispness was in the air which filled me with vitality and

an eagerness for the job before me. The sun was bright, though the borders of the earth were trimmed with huge white clouds—clouds which always fascinated me.

Purposely I did not start for the battle field until ten o'clock. I did not wish to look over the ground and live over the stunt again and again before it was necessary. So Gunboat and Frank and I sat down to our cutthroat pinochle and became so interested in it that we forgot time. At ten-fifteen we had to quit, leaving nobody with a game. That was bad, but the picture needed a crack-up, so we all three went to the location.

A great crowd was there when we arrived, and as I passed through it I could easily hear the odds against me. Some were betting five to one that I'd be killed; others had bets of ten to one that I'd never walk out. Naturally, I bet on myself.

Wellman, Hubbard, and I walked over the ground for the last time. We figured just about where I was to dig in and approximately where I'd end up. When we had completely covered all of the ground we gathered the forces: the rescue crew, ambulance corps, and those on police or fire patrols. They were a serious-minded, serious-faced troupe that bade me good-bye as I hopped into Lieutenant George Rice's army transport. The next time they would see me would be after the crack-up.

Already at Kelly Field my little baby Spad was warming up. It was r'aring to go, even to its own funeral. I stroked the back of the fuselage with a feeling of kindness. It was not quite right to do this deliberate thing to a friend. And it had been a friend. As many hours as I

had sat at the controls it had given way but once. Always it had answered controls, had done as I had wanted. And now it was going on its last flight for me.

I put on my leather coat and my helmet and goggles. I got into the seat and adjusted the safety belts. Then I "tuned up" the motor and the little ship tugged at the blocks as if it also were eager to go. The two P-1's with Cornelius and Thad Johnson were also roaring in a test, and farther down the starting line I saw a squadron which was to escort me to the battle field. We were all set. A few minutes to wait and it would be history.

Wellman was to telephone me when they were ready, and it was a long wait for me and my little ship. I guess it must have been particularly so to the little Spad I was riding in, all dressed up in its new clothes awaiting its death.

Then came the call. A mechanic rushed from the hangar to the starting line. It was the order to take the air. Again I gave the gun to the motor to clear out the barrels, and I fastened my chest safety belt.

Then just as I was pulling my goggles over my eyes someone clutched my shoulder. It was one of my friends, and there was a wild, frightened look in his eyes.

"For God's sake, Dick! Give it up. It isn't too late yet. Tell them motor trouble, or that you're yellow—anything. But don't do it; it's certain death."

Now wasn't that a break? One of your best friends comes to you with tears in his eyes, telling you you haven't got a chance. And he knew that I wasn't one who would ever back out, even if he was right.

I gave the little baby the gun and the wheels left the ground. Simultaneously the two P-1's took the air and then the escort squadron.

As we headed for the spot I rather wondered what those in that escort squadron were thinking. Did they believe that they were an aërial cortège? They rather looked like it because the location could not be missed. I laughed, though it really was an honor which I appreciated.

We were now over the No Man's Land and the squadron split in all directions, leaving me alone with the two P-1's, which were supposed to be the German ships to shoot me down. I dropped to an elevation of eight hundred feet and took off my goggles. I could not wear them because the splintering of the lenses might cut my eyes. When in proper position I dropped them and was pleased to see that they fell directly before the main parallel. That was my signal to those on the ground that I was ready, that the next time I buzzed over the spot it would be a crack-up. Then I awaited my answering signal and got it immediately: a red flag from the tower.

I manœuvred to position for the right glide that would bring me to the spot where I was to shove the little ship in nose first. When I had it I glanced back to see if the two German scouts were on my tail. They were, and how! It almost seemed as if I could reach out and touch them.

With a shove on the stick I nosed my Spad earthward and at the same moment felt a peculiar whizz. One of the Germans had passed over me so close that I felt his prop steam. They continued to harass me, apparently pouring in their deadly stream of machine-gun bullets. Then they

would zoom up just long enough to do a vertical so they could get into position for another attack.

But I could pay little attention to them. Closer and closer were the ground and the spot approaching. The time between me and this crack-up was but a matter of seconds now. Yet I felt a peculiar exhilaration. I had supreme confidence in my ability to do this thing and walk out. I smiled as I thought of all of those grave faces and palpitating hearts on the ground. They who were watching it were getting the thrill, and I who was doing it was the confident one.

Glancing at my air-speed indicator I noted that I was making a hundred and ten. That was too fast, so I cut down on the throttle. Now I was making ninety, but that was too slow. I was settling.

The German trenches were beneath me as I gave the motor a little more gun. There was only No Man's Land between me and the spot. It was now time for me to get busy. I started the automatic camera just as one of the Germans hissed one of his last good-bye dives at me. The trenches and the spot where I was to go in were less than six hundred feet away. I had to allow at least two hundred of that for the crack-up. It dwindled to five and snapped to four, flashed to three and exploded to two. Two hundred feet. Well, I'd allow another fifty. I'd give them a real close one. Just ten feet from the ground! Just ten feet to go. Speed—ninety-five miles per hour.

I jerked the stick over to the right, giving just a slight left rudder. The wing dipped and the fuselage swayed to

the left. In this position I knew the ship would be a cinch to go on its back, but that's what Bill wanted.

With a dull thud the wing hit and crumpled, then the landing carriage crashed. The poor ship tottered over to the other wing and broke that, and the thing started over on its back.

As it did I ducked my head forward. It was my one measure of protection, but it happened to be just the right one. With a terrific crash something wedged between my flying coat and the back of the seat.

But the last move of the ship was over. There was no more débris or dust or propeller splinters flying around. Again I smiled as I wiggled the rudder. Then I unfastened my safety belts, holding to the sides as best I could because I was upside down. To have fallen would not have hurt me, because there was just six inches between my head and the ground. I jumped into a shell hole as directed and waited until the explosions ceased around me.

When it was all over I climbed out and then I got a few surprises. I had intended to land close to the cameras and I hadn't missed. The nearest one was seventeen feet from the wrecked plane. What kind of nerve must a camera man have to see an airplane travelling at a hundred miles an hour crashing into the ground so close to him that he can almost reach out and touch it? My next surprise was that I had missed the areas with the balsam posts and had hit into those driven into the ground two feet and protruding about four. I thought I had missed the barbed wire and real posts. I wasn't so surprised to find I'd missed

that little spot, but I certainly was to find that I had pulled or torn fourteen of those posts from the ground.

Then I wondered what had wedged between my coat and the back of the seat, and that's where I got my real thrill. In making its last speedy manœuvre, that of going over on its back, the ship had plunged into a maze of posts, two of which had gone completely through the fuselage. One was uninteresting to me, for it was near the tail. The other had penetrated the cockpit just eleven inches back of my head! Had I not moved forward when I did it would have carried that important member of my body down to where my feet ought to have been. This gave me something to think of. Why did that post have to come so close? It was rather an uncomfortable feeling that I got for a moment as I wondered what kept it from coming closer.

I noticed one more thing. The tail of the ship hung in space, over the edge of one of those twelve-foot shell holes. If I had slid on my back as I hit it would have been too bad. I'd just have—— But there was no use ruminating on ifs. The poor little ship was dead. There was not a spar or rib in it that was not broken. From propeller to tail and wing tip to wing tip it was splintered and broken. It was as I had meant it to be. Still I regretted the loss of it. Yet I should not have been downcast, and wasn't. Lady Fortune had been with me all around, so I went over and had some lunch, collected my bets, and then Gunboat and Frank and I finished our pinochle game.

XXV

THE D-7 WINS

MUCH happened besides a game of pinochle in the next few weeks. There were more crack-ups. There was dog-fighting and there were ships on fire ; then there was the one big battle scene when the concentrated offensive was supposed to take place against the Germans.

On this day every ship took the air, and that meant that the sky over the battle field was as if infested with a plague of locusts, so numerous were they. Squadron after squadron of De Havilands and Douglasses passed over, followed by the big cumbersome Martin bombers. While these were dropping their loads the fast little scouts darted in and out like wasps, "strafing" the trenches or putting on air duels.

On the ground the machine-gun nests sputtered out their apparently deadly fire while armored tanks "klanked" their way over trenches and shell holes. The big guns spurted their blasts and the smaller guns backed up their bigger brothers' voices. Altogether it was just like war.

In the midst of it all two of the P-1's ran out of gas and had forced landings. Lucky stiff, those two pilots, for they both walked out. One of them crashed into the side

SQUADRON OF DEATH

top of a hill; the other landed, but hit a ditch and went over on his back.

Finally the smoke cleared away from all of these scenes, and we scheduled the Fokker crack-up.

But to put a crash on schedule does not mean that it is to be done at any particular date. It is merely the last warning to be ready within notice. So I proceeded to prepare the Fokker for the stunt. It was much easier than prepared the Spad because the fuselage was constructed of steel tubing, thus eliminating the necessity of reënforsing it with additional bracing. But of course many of the other features which we had incorporated in reconstructing the little ship which I liked so much were also employed because from an engineering standpoint we had been right in our previous work.

Three days from the time that I was given the tip to prepare the ship it was on the line ready for a test with its complete crack-up paraphernalia. The crews were assembled and given practically the same instructions as in the previous instance. There was but one difference. This time the day for the stunt was to be kept a secret, because in other hazards, such as my first crash, we had had an unusually hard time to control the crowd, and to keep it from the danger zone immediately following the last move of the ship. Therefore we decided that the utmost secrecy should surround all of our movements.

I said that the ship was ready for the test. We thought it was, too, until I took it up for a final hop, because there remained but one thing to determine—the proper functioning of the motor.

The mechanic expected an O. K. after a short flight. So did I. When I took off the motor was turning up about 1700 r. p. m.'s., which did not displease me at all. It seemed to respond in every way. It climbed, dived, and banked to my satisfaction. There was some little rudder interference due to the camera being mounted too near the vertical fin, but it was not enough to demand a change.

So I decided to do a little hedge hopping, as I had in the morning in a flight from Kelly over to Leon Springs, where the German airdrome was situated. But I had no more than nosed the ship down than I developed a miss on about four of the six cylinders and just barely managed to limp back home and squat on the lower end of the field.

The mechanics thought it was trouble in the gas lines, because I had not turned on one of the tanks. This was opened and the ship taxied up to the starting line. One of the army's expert mechanics got into the seat, and when the blocks were under the wheels gave the motor the gun. It answered perfectly for the five full minutes he held it wide open.

He gave me a peculiar look as he handed the thing over to me for another flight. Again I was off, but this time it started to miss when I was but seventy-five feet from the ground and at the end of the field. I just barely managed to slip at right angles and land with the wind, contrary to all the rules of the field.

Again the mechanic came over. He had not heard the miss, and was somewhat surprised to hear of it. Nevertheless, he changed from one type of spark plug to another

and again tested the D-7. It was the same old story. It turned up its full amount of revolutions without a suggestion of a miss.

I sensed his feelings. He thought I didn't like to fly the thing, and in one way he was right. This ship which continually let me down began to get on my nerves. I did not like the idea nor the ship. It was not the type of plane, for nothing flies sweeter than a D-7 in perfect working order. The black Fokker (this one was gray) which I had in the hangar was the prettiest thing on motor and control which I had in the station.

But I felt no confidence in this one. I hated it, and I am sure that that same feeling was returned to me by that inanimate thing.

But the mechanic evidently did not believe that I had a serious miss, so after the spark plugs were changed I took off, banked at a low altitude, and turned with the wind. That brought me back to the starting line within a few seconds, and, just as I thought, the motor hit until I was in a half bank into the wind, then started sputtering and coughing like a person with consumption.

I smiled as I saw the mechanics gather on the line. At last they knew that I really had more than spark-plug trouble. Of course, I was forced down, and as I taxied the thing into the hangar, this time still missing, both the mechanics and I knew that they were in for some snappy work.

And how they worked! They changed timing gears and bored holes under the oil rings. They even changed pistons. New wrist pins replaced the old and the bearings were

refitted. But it did no good. Practically a new motor was built. Yet out of eleven flights I had eight forced landings.

And the more it let me down the more I cursed it. I would go some distance away and look at it with pleasure as I thought of what I was going to do to it. It would be a keen pleasure to bump this thing's nose into the ground, to hear that crunching sound as the motor pushed up against the gas tanks and the wings folded. I deliberately planned to smack it in as hard as I could without injury to myself.

On the other hand, maybe it would have the "ad" on me. Perhaps this was the one ship which would have the last laugh. The stunt was difficult—nosing in with full motor and almost full speed. Really it was not much more than an even break whether I walked out or didn't. I wondered which would win. Yet I knew one thing. I would do as much damage to it as it could do to me.

Finally we all got disgusted with the ship's eccentricities and shoved it into the hangar, where it sat with its lousy motor covered. It was awaiting its doom. If that motor would last me from Kelly to the field at Leon Springs that was all I asked. Just one half hour more in the air for it and another old ship would bite the dust.

We, the Fokker and I, were ready for the battle. Wellman and *Wings* were, also. I was given orders that the stunt would be the very next day.

Again, as soon as I knew for a certainty that I was due, I went to the suite and waited as patiently as I could for the rise of the next day's sun. But I was not able to sleep before this crack-up as I had on previous occasions.

My nerves seemed pitched unusually high. At one in the morning I got up and wrote letters. At five I was still writing. Then only was I able to drop into a troubled doze.

When I arose it was almost eight o'clock, so I hurried to Kelly Field. But once there I was told that there was no occasion for any rush, that someone had evidently forgotten to order the clouds. Before this clouds never bothered me. I had taken them as a matter of course in Texas during this period of the year. Yet here was a morning without any, which made it impossible to do my shot. The rest of the picture was filmed with these beautiful white monuments of the sky, therefore it was necessary for them to be the background for this crash.

I was disappointed. I had come ready and prepared to have it out with the Fokker, yet I was fooled. However, I did decide to fly the luckless thing over to the German airdrome, and so it was dragged out and the motor cover removed.

Remembering quite distinctly how it had tried to drop me on almost all of its previous flights, I gained some altitude before leaving Kelly. I felt quite safe with three thousand altitude and started the thing on its next to last journey.

With such altitude it was possible to find an emergency field almost the entire distance between the two points. There was but one stretch of about ten miles, where no field was available, and of course the motor took its usual course. It bucked and back-fired until I thought I'd be pretty lucky if it didn't catch on fire before we arrived.

Certainly I was thankful when I planted its two wheels

and skidded on the short German field. This time I said nothing about the miss. I was getting rather accustomed to it, and if it ever did make a flight without acting up I'd probably have gotten out and pulled a plug so as to put it back in form.

All that day we waited for clouds, but not one appeared. The sky was as clear as the blue of a robin's egg. I was anxious, and so was the company. Every hour of sunlight meant thousands of dollars. But the sun retired behind the sagebrush and greasewood in a perfectly clear sky.

The next day was the same.

The day following was a repetition.

Four days following that completed a cloudless week.

By this time I was at the point of nervous exhaustion. In the evenings I would sit around the room waiting for the time when I thought I could go to sleep. But when I hit the hay I would live that crash over and over again, and try to figure out which one of us was going to come out second best. And if I dozed into a light sleep I would usually see myself getting the worst of it, and would dream that the thing was on fire and I was trapped in it, or that I lay with limbs broken unable to move in any direction, while gas poured into my face from the broken tank. Then I would awaken to find that the bed was soaked with perspiration.

This was worse than a prisoner waiting in his death cell for the fatal day and the fatal order that would send him up those last thirteen steps. At least he knew absolutely when his time was up. But me? I'd get the order only to get a stay of sentence.

We tried to make clouds. Huge quantities of shells were sent into the sky at the same time, but they formed only slight rifts against the blue, whereas we had been photographing definite outlines. Never until then did I realize just how much it took to make one small impression in the sky.

The sweats were weakening. I was losing weight, so I decided to do a little "stepping" to relieve my mind. The army was giving a big "hop" out in the dirigible hangar at Brooks Field, and being duly invited I dressed in a tux and appeared on the scene. Somehow or other I got mixed up in a procession which wanted me to go past the receiving line, and finally I obliged them.

When I came to Major General Fechet he turned to a man in civilian clothes and said, "Oh, by the way, Mr. So and So [I didn't catch the name], I'd like to have you meet Dick Grace, the young man who is doing all of these spectacular crashes for *Wings*."

The one in the tux looked me over and expressed some slight pleasure at the acquaintanceship, then said, "I'd like to see you do these things, Mr. Grace."

It must have sounded very abrupt as I answered: "Come on out to-morrow and I'll show you."

"Say," said the army officer at my side, "don't you know who that is?"

"Haven't the slightest idea," I replied.

"Well, get wise to yourself. That's Trubee Davison, Assistant Secretary of War for Air Service." Socially I am a complete flop.

Still, getting around a bit helped me to keep away from

too many mental Fokker crack-ups and at the same time tired me enough so I could sleep fairly well at night.

While thus socializing I met a youngster whom I had known in Los Angeles. I had given him his first ride in the air years before, shortly after Clover Field was founded. His name was Clement Phillips, and he was taking the army course of instruction. At that particular time he had just started at Brooks Field. How lives intertwine! I had much flying to do with him that neither of us suspected.

Another interesting person was one by the name of Blanchard, who had been in the R. F. C. He was one of our troupe, but did no flying. Always he kept telling me that he was going to build a ship when he got back to Los Angeles. We used to argue points of construction and I always lost. Eventually he built the ship and I still said that there was nothing right about it and refused an offer to test it. So did all the rest of the old-timers. So he tested it himself and killed a couple of others at the same time.

For two weeks this thing kept up. It seemed that the cloud manufacturer had gone on a strike just because I had to push in a D-7. I formed a habit of staying up until two o'clock or after, so that when I did retire I would be so physically and mentally tired that it was impossible for me to stay awake. My sleeping hours were narrowing themselves to a matter of minutes, yet with it all I felt as physically fit as I ever had in my life.

Then one morning I awakened and there they were. Clouds covering the entire sky. I did not wait for a telephone call. I did not need any signal other than that one

look out of the window. This was the day for which I had lived almost three weeks. The waiting was finished. In a very few hours a verdict would be rendered by the High Court in the case of the D-7 *vs.* Dick Grace. In a few hours I would be released from that prison and once again be able to enjoy life as I had before I flew the Fokker.

But for some reason I did not feel at ease as I rode out to the German 'drome. I had shaved, bathed, and taken a cold shower. I had had a good breakfast, yet with all of my morning's preparations I felt weary as I eased myself into the back seat of the car. Nor did I feel any better when I reached the field. Rather mechanically I went through the régime of directing and placing the different rescue crews. Listlessly I gave orders that the wing struts of the D-7 should be sawed. The cameras were set up at convenient angles. My preparations were completed. Reynolds, Tomick, and I went on a last inspection tour. We checked the first-aid division, saw that each man had his instrument of rescue, placed the chemical fire wagon and the men with extinguishers at various points. After that I drained all of the gas out of the ship and poured back just two gallons as a further protection against fire. A report was then sent to Wellman that I was set.

Climbing into the cockpit, I adjusted the belts. My helmet was already tightly strapped. Then I glanced at that troupe, watching my movements with panicky interest. Could they know what I knew? Was there any reaction in their minds? I did not believe so. Yet I knew that I was to be injured. Again came one of those few

presentiments in my life, and I could not ignore it or get the thought out of my mind.

Only Wellman seemed to guess.

"You're sure you feel all right?" he said.

"Absolutely," I replied.

"—because if you don't we could delay it a day or so," he continued.

"After all of these weeks of waiting? Not for anything in the world! Are you ready?"

"I'll give you the red flag. Any time after that. Only be sure to time your start with Johnson's dive for you. At that time you must be about seventy-five feet in the air."

I understood these directions perfectly. Thad was supposed to be Dick Arlen, one of the heroes of *Wings*, who crept to the German flying field, stole a ship, and then, banking suddenly, dropped down on an enemy who was taking off in pursuit of him.

"Contact!" I ordered, and the big motor broke forth in a howl of hollow explosions.

And with them there came a peculiar exultation to me. I was not the uninterested person of a few minutes before. I was raring to go; anxious to tear the Fokker's nose into the dirt and wreck it badly enough so they would touch a match to it where it lay, rather than gather up the débris.

I wanted to do it now. I was eager to start. Not because I wanted to have it all over with but to enjoy it as I did it. I wanted to hear those wings crunch and to watch the sky

disappear and the earth coming toward me as I started rolling over on my back.

I turned to my mechanic and smiled. In return he came forward to shake my hand and wish me luck, but that was my one superstition—never to shake before a stunt.

I turned the motor to its full revolutions, and for once in its life it did not talk back. It grabbed the gas as a race horse takes the bit.

A red flag! Johnson gave the P-1 the gun and was off in a cloud of dust. He made a beautiful climbing turn and verticaled back in my direction. The blocks were from under my wheels now, too. I also was ready to take to the air. I glanced once more out of the side of the cockpit to see if the field was clear, and also to locate the spot where I was to kill the Fokker.

Johnson was in position. It was time for me to get a mean start. And I did. I gave that old enemy of mine the works, and its tail spurted from the ground. The wheels seemed not to gather speed quickly enough, so fast did it gather speed. I was off; off for the last time with that enemy! Now was the time and place for our last struggle. Looking back, I could see the P-1 diving on me. He was coming closer and closer and he had to because I was nearing the spot for the crack-up.

Above the din of my motor I heard the roar of his machine guns. It was a signal. Now was the time. And the spot was there waiting for me. I smiled. Johnson and I had timed things nicely. That nose shot groundward, and as it did the motor sputtered and missed. It would have its way, even on its last flight. But it did not matter now.

It was going in. And how! My speed was a hundred and ten miles per hour. I knew that it was pretty fast—maybe too fast. Still I was anxious to see what kind of a crack-up such speed would make. More than that, I almost had to have it to get into the proper position for the cameras and to reach the spot. Then there was another reason. I hated the Fokker.

Between the time I shoved that stick forward and dipped a wing I paid it a lot of compliments. I could now. It would never miss or be missed again.

With a crash the wing tip went into the ground. The ailerons and the lower panel crumpled. The propeller split and shattered in a thousand different directions. I was satisfied. Everything was as I had figured. I was distributing my forces and my speed nicely.

Then happened one of those little things of such inconsequence. The landing gear, which was of steel, withstood the first terrific jolt and the solid beams of the wings did not break. With little of my speed slackened the injured wing lifted from the ground. The cross wind caught me, and I was in the air. My ailerons were useless—broken. I could not dig in a wing. If I travelled much farther the shot would be entirely useless. My motor was already out. I had “cut it” when the propeller had first hit the ground.

Now there remained but one course. I would have to nose the thing in, and a “nose in” is bad at any time. It meant that the full force of the crash would be transferred from the motor to the fuselage and to me. I pushed my chest against the belt so that there would be no snap as I hit, then I shoved the stick forward. I was headed for

the ground again. It loomed up so quickly that I gasped. This was too much speed.

I hit. I felt the terrific jar quite distinctly, and knew that my chest belt had broken. Something in my brain recorded the fact that I bumped the padded instrument board and that my head broke through it. Then I thought of fire, of how once before I had been so terrifically burned. Would this be the one time that such a thing would happen to me in an intentional crash?

All of these details perhaps took less time to travel through my mind than it takes for a voice to carry over the radio. I was still thinking and wondering when that curtain of darkness blotted out the daylight.

The D-7 won the verdict.

XXVI

A HONOLULU TAKE-OFF

WHEN I awoke I was lying flat on the ground with a group of my rescue squad around me. They were just in the act of taking me to an ambulance. Some of them grabbed me by the feet and others by the shoulders. Then as they started to lift me the clouds must have bumped together. It must have lightened or something, for I received a shock that nauseated me.

"My neck—don't lift me. Let me stay here a minute." Again they put me on the ground, though everybody was in favor of taking me to the hospital.

"How did you get me out?" I asked.

"How did we get you out?" they inquired. "Why you did the prettiest fall from that cockpit I've ever seen," said Ross Cook.

I was silent for a few minutes trying to figure this out. The last I remembered was fearing fire, and being unconscious and unable to rescue myself from the burning wreck. Then the startling truth dawned on me. So fearfully was this dread of fire impressed on my mind that when I hit and broke through the instrument boards I had unconsciously crawled back to the seat and had fallen over the side of the ship. More than that, I was told that

I had crawled three feet away from it. Three feet—with a broken neck!

But I was given little time for reflection. The doors of the ambulance were waiting for me. My protests won, however, and I was allowed to stay where I was. After a short time I braced my neck with both hands and had someone lift my shoulders. Again I was on my feet. But it seemed as though a red-hot iron had been rammed into my neck. It burned and pained until I was actually dizzy.

Then I was called to the front of the plane to take a picture with Lucian Hubbard and William Wellman. That was funny. When they started setting up the still cameras I was standing between them, and when I saw the camera man again he was just ready to pack up his stuff.

"Aren't you going to shoot the picture?" I asked.

Everybody looked at me peculiarly.

"How many different poses do you want?" jeered the camera man. Evidently he had already taken them—while I was "out" on my feet.

"Guess I'll go to the hotel and rest," I said.

"The hospital's much quieter," said Bill.

But I went to the hotel.

Immediately I went to my room and flopped on the bed—boots and all. I attempted to find a position which would ease that almost overpowering pain in my neck, back, and shoulders, but it couldn't be done. It was there, no matter how I lay. I got up, took off my shirt, and was surprised to find that the neck was swollen.

All during the night it was the same. The next day also. I surmised that it might have been wrenched pretty

badly and decided to go to see a doctor the next day. First, however, I must go to see the location for my last stunt, so the greater part of the day was spent hiking over rough country. When I came in I started for my room, but only managed to get halfway down the hallway when I plopped to the floor.

I really began to think something was wrong, and so after I was helped to my room I called the company executive offices and told them of my troubles and was ordered to the base hospital at Fort Sam Houston immediately.

There Major Norman T. Kirk looked me over. I told him that I was somewhat in a hurry as I wanted to fly the other Fokker that evening. But he rushed me to Colonel Pillsbury and had X-rays taken. The two of them conferred for a few minutes when they saw the plates.

"Guess I'll be going," I said. "I'll be back to-morrow for treatment."

"You're not going any place, young fellow, except to bed!"

"Bed?" I repeated unbelievably.

"Right! It's a wonder you live at all. You've got what is ordinarily termed in present-day language a—broken neck."

"What——"

"And that isn't all," he continued. "Your sixth cervical vertebra is dislocated—out of line an eighth of an inch. That's enough to kill almost anyone."

"How bad is—is it broken," I said with a sinking feeling.

"Well, you've got only seven of them between your skull

and your backbone, and you've got four of them broken—besides the dislocation."

"Guess I'll stay," I mumbled.

"Thanks," he said ironically.

What he didn't do to me when he took me to the operating room hasn't been performed yet by medical science. In the first place he bound up my chest bone, which was cracked, and then he strapped a harness of gauze around my head. This tied into some sort of arrangement of hooks and pulleys, and I was hung much as a criminal might be, with just the bare tips of my toes touching the floor.

The added pain sort of "washed out" my strength, and I asked for a glass of whisky. This down, I felt worse than ever. Finally I was convinced that to let him do his work right he should give me an injection. When I awakened hours later I was in a plaster cast which covered me from ears to chest—flat on my back, and if my guess was right I'd be in just that position for some time.

It is a peculiar thing that the first thought that flashed through my mind as I lay there in an absolutely helpless condition was: What an age existed between the time Locklear was killed and I got that broken neck.

Some time later it was decided that I was well enough to be moved to the Hollywood hospital, and so I was shipped back. But one thing Major Kirk told me: if I ever stunted again, if I ever crashed a ship or received a blow on the head, I could kiss this life good-bye. I know he is a great doctor. Certainly he is a good friend. But the Major forgot a stunt man's capacity for punishment when he made that statement.

Just to prove he was wrong when I got back to the Hollywood hospital I had them immediately call Georgie Smith. I knew she'd be delighted to see me. And she was. When she saw that twisted face (I had a slight paralysis of the right side, which twisted my features out of shape) she let out one scream and departed.

The next day she sent a special messenger with a note which said:

DEAR DICK:

So sorry to see you injured. While you were away I became engaged to —, who is directing for —, so I guess it's better if we don't see each other any more.

I added blanks to my conversation and decided to go over and see her. But my physician in the Hollywood hospital had cut off Kirk's plaster cast, and my eleven weeks' growth of beard under it, and had substituted a harness of weights which tended to keep my neck under a constant pull. It would be hard to get dressed and out of the hospital without attracting attention, so I sent my nurse for some orangeade. In the meantime I unloosened the contraption and got my clothes. Before she was back I was dressed and had jumped out of the second-story window.

After all of this trouble Georgie Smith was out for the evening, so I walked back into the hospital again. Of course they were *somewhat* surprised, both at my leaving and at my being able to come back.

Six weeks later I was legitimately released and left to my own resources. I wondered if Kirk was right. Perhaps

I had better give it up—at least temporarily. I still had considerable pain. There was yet quite some pressure on my nerve centres. Major Kirk said that I would always be in such condition and I began to believe him.

So I invested my savings in an exclusive little Travel Shop in Pasadena and got a kick out of being a business man and a merchant. Certainly quite an extreme from my last stunt.

It was all right for a while. Then the boys began making over-ocean flights, and of course that appealed to me. If I could make just one long flight perhaps I might get some of this out of my system. According to percentages there was not much more danger in this type of flying than there was in crack-ups. Certainly Major Kirk could not object if I hit the water in between continents. I probably wouldn't get my head bumped. All I'd have would be a lungful of H₂O.

So I sold my paying little shop. Then I got a manager and interested him in the venture financially. With all he had and could get and what little I had we bought the ship and decided to fly somewhere. The best place to go or to come from, I thought, was Honolulu, so I packed my tiny little monoplane on board a freighter and embarked for the islands.

It took six days to get there, and every hour that we travelled I was thinking I could make the trip much more quickly than Mr. Matson's boats.

Still I could not exactly think of this adventure as a pastime. The sky was overcast with clouds and fog day and night, which was not encouraging to me, as I knew

that my little thirty-six-foot monoplane would be terrifically overloaded if it got off with enough gasoline to span that distance of twenty-five hundred miles. Furthermore, I knew of no field in the islands long enough or in good enough condition for the precarious take-off which was to be mine.

When I landed I was immediately taken to the naval base at Pearl Harbor and there began an intensive study of the conditions which existed. Commander McComb, who had been stationed at that base for some time, was of invaluable assistance in giving the actual facts, but none was so important as my mechanic, Carl Spangenberg. The buzzard had only one eye, but I'd like to be able to see as much with both of mine as he does with that one. Not only did he care for the motor mechanically, he rigged and doped the ship, and even slept with it to be sure that none of his adjustments were tampered with.

None of the fields on the island of Oahu met our requirements, so with an escort of naval planes I flew to the island of Kauai, where an improvised field was under course of construction for me. There again the hospitality of the islands was shown me through Lindsey Faye, who with the entire force of men from his plantation helped Carl build the field to my requirements.

Days were consumed with minor details. Algaroba bushes had to be removed and hollows filled in. My propeller, which had been broken in transit, was replaced by a steel one which arrived just before my first attempt at a take-off. Courses had to be charted and weather observations taken. Everybody was busy—so busy that we

averaged about three hours of sleep daily. They even put a naval guard around me in an effort to get me to rest. But do you think that I could sleep while weather reports were coming in? After all, I was the one most vitally interested in them.

Everything was in condition long before the weather was. Always there was a wind estimated variously between twenty and thirty knots blowing directly from the United States, which meant that I would have to buck it. It just couldn't be done. As it was I was travelling on a margin of two hours' gas. If I encountered wind I'd find myself looking for a service station about three hundred miles seaward from San Francisco.

Then late one night favorable reports began floating in. That was a signal for activity in our camp. By daylight we were ready for the take-off.

If you've never attempted to take a muchly overloaded airplane from the ground don't do it. That morning I gave the Whirlwind motor the gun, expecting of course to gather speed sufficient to lift me in about a thousand feet. Well, the ship just stood there—didn't budge an inch with full gun on till the man got back of the struts and gave it a push. Then I knew it was heavy. Slowly I moved out and got up quite some speed. The next jolt was discovering that I had not sufficient rudder for the amount of load I was carrying.

There came a sudden end to that particular morning's flight. The tires were not especially made and even with eighty pounds' pressure the ship squeezed them halfway to the ground. Evidently I hit a small stone and—

boom—the tire blew. I think I was making about sixty when that happened and I immediately started the prettiest series of ground loops you ever want to witness.

On the next two mornings I made three other unsuccessful attempts and was naturally beginning to get discouraged.

I realized one thing, however. I'd never get off at all if I didn't do it while it was still dark, because with the slightest sign of daybreak the air became light and un-supporting.

So on our next attempt we were waiting for those few minutes that precede the dawn, and at that carefully measured moment I gave the gun to the little ship and was down the runway. Conservatively I held the wheels on; yet this morning it seemed to get up speed more quickly, and I began to feel it get lighter on control. This was to be the take-off.

And it was. As I passed the last red flag in the hands of Carl Spangenberg I raised the wheels from the ground and was away. The cliff at the end of the runway I cleared by seventy-five feet.

What a thrill after such hectic attempts! Now most of my troubles were over—or I thought they were. I thought that all I would have to do would be to navigate and control the ship to the point which had been selected in California. But I was mistaken.

I entered a tropical rain, which in Honolulu they call "liquid sunshine." The rain did not bother me, and I knew it wouldn't my motor, but when in the very centre of it the ship seemed to shiver all over. I instantly thought I

had developed a "flutter" of the wing, but was soon convinced that this was not the case, for I went into a dive without having a thing to do with it. With the load of gas I had on board I thought that it was all over, because if the ship didn't go down I was a hundred miles from the island, and boats there were as plentiful as clouds were when we needed them for the D-7 crack-up.

I shut off the motor and pulled back on the stick and managed to come out just about fifty feet from the water. Then I gave the ship the gun again and got back some little bit of the altitude I had lost. At the same time I tried to spot one of the native sampans, but I don't think a boat was ever in those waters; at least, there was none there then.

All of the way back it was the same thing, first a stall then a dive, and I got more cheap thrills that morning than I've had in nine years of stunt work. Finally I sighted the island.

The next question was what to do with the ship now that I had it back there. If I came down for a landing and it suddenly went into one of those dives—— Well, with that load of gasoline it would be just too bad. Yet I couldn't do anything but try, and before I even started the attempt I knew that it was a crack-up. Again this would be a good one because I had to have about three-quarters motor on to have any control, and if it was full on I had none.

Just then the ship dipped again, and the wings and fuselage shook until my right foot was numb trying to keep even rudder on it. It had to stop. If there must be a

crack-up I'd have something to say about it. With a quick glance I sighted the biggest algaroba tree I could find and smashed into it.

If the flight was a failure that crack-up wasn't. And I didn't have any safety belts or special gas tanks, either. When I hit that tree I tore twenty-one feet of roots out of the ground. Of course I was thrown for a loss, but when you hit with a ship loaded with six and a half barrels of gas at about a hundred and twenty and just break a rib and a hand, what kick have you? I thought I was so lucky that I didn't have either of them set.

I had been given a little three-weeks-old wire-haired terrier for a mascot, and naturally the first thing I thought of when things quieted down was what had happened to her. Imagine my dumb surprise when I found her still sleeping. Her registered name was Kauai Lelani, but I called her Dizzy. Anything that could sleep through a crack-up such as that was is a little bit off.

Now she's seen her fourth intentional crash, and sits up and howls like a baby if I won't take her with me. And if you think she doesn't brag about it you're silly. Every dog in the neighborhood has to listen to her line.

XXVII

THE BUZZARDS ARE BORN

EVERYTHING I had was in the flight, so when I stepped from the train in Los Angeles I was not surprised to find that my total capital was just what it had been years ago when I first arrived in the city. I had just twenty cents. But my position was somewhat improved. I was acquainted. Now I was recognized as a stunt man, and so knew that I would not be in Hollywood long before work of some kind would be thrown my way.

Nor was I wrong. I entered into a managerial contract on the very next day with Edna Schley, who immediately signed me with First National Studios for a picture called *Lilac Time*. Colleen Moore was the star.

On conferring with officials of the studio I was told that I would be in complete charge of the aviation sequences of the picture. Furthermore, that it would be up to me to organize a squadron, which could do close and probably very dangerous flying. As an added attraction they made it plain that there were to be three airplanes crashed intentionally and hoped that I would undertake those with my other duties.

To do the crashes alone would have been a good job, but to find and build a squadron, to hunt up enough ships of

one type and convert them to look like old war-time crates, and to locate a field in southern California that would look like northern France was a job that would keep me more than busy.

My first concern was the proper kind of a field for the take-off of seven planes in a line. If they had to be as close together as the director said, then I would have to have a field that faced into the prevailing wind, and one as smooth as it was possible to make it.

For ten days Frank Ward, the studio location manager, and I looked for a stretch of ground that would suit the technical requirements of the picture and my practical requirements for flying, but there seemed to be no such piece of ground in California. Once again we talked of going to Texas as we had on *Wings*. We had found but one field which I would O. K., and it was not suitable from a picture standpoint—the script called for a row of trees on one side and one end of the landing place.

We searched by airplane and by car and finally located about the only spot in the state that was ideal. Up in the mountains between Los Angeles and San Diego we came to a little plateau, the side and end of which were lined with giant eucalyptus. From a picture standpoint and for my purposes it was great. It was fully two thousand feet long and almost half that in width. Yet when we stepped out on the ground my spirits fell. The surface was so soft that my boots sank in to my ankles. I walked all over it and found the same general condition existing. Yet it was the only location we could find. This had to be the spot.

There were other drawbacks. Water would have to be

pipied for over a mile, and six miles of telephone line constructed to make a connection to the nearest ranger station.

The field was my only source of worry, and a few days later that isolated spot in the mountains was a scene of activity. Men with shovels were filling in ruts, others were cleaning out bog holes and refilling them with sand and railroad ties, and a giant steam roller was crushing the soft dirt to the hardness and smoothness of a paved road. Hangars, tents, and war equipment had to be brought up those rough mountain grades, and it was just our luck to have a heavy rainstorm. Over the fourteen miles between our camp and the main road trucks, wagons, and automobiles were mired until pulled out by mule teams engaged for that particular purpose.

Another crew was converting my commercial ships. One mechanic was welding machine-gun mounts, others were making special cowlings, while still others were changing radiators, tuning motors, and checking ships.

Then came the formation of a squadron, which Director George Fitzmaurice had ordered capable of any kind of close formation work. Naturally I scouted around for any old companions, but Frank Clark and Frank Tomick were already engaged on *Hell's Angels*. Maurice Murphy was also with them. Leo Nomes was busy on a Fox picture. Ross Cook was the first one engaged. He had been with me on *Wings*, not so much as a flier, but as a technical man. However, I knew him to be good on the stick and so gave him Position No. 1 on the squadron. In other words, if I was sick, injured, or busy doing crack-ups Ross would command my squadron.

After a final test and check of qualifications I selected Charles Stoffer, Frank Baker, B. M. Spencer, Lonnie Hay, Clement Phillips, and a youngster by the name of Baxter.

What a peculiar squadron it was! In it there were apparently no two like personalities, nor had any two the same occupation before entering aviation. One had started out in life with the ambition to be a minister of the gospel, though when I met him I certainly would not have guessed it in his speech. Another was a graduate engineer. Among the rest were an ace in the war, a millionaire's son, a boy who had done some "time," a newspaper man, and an embryo lawyer.

I selected them because I knew that they were good fliers, yet I knew at the same time all of them were gentlemen and most of them scholars. I explained my plan to them—not only to use them for this one picture, but if we were all agreeable to keep them always as a squadron—and for a name of this squadron I gave them a choice. I wanted them to decide whether we should call it "The Buzzards" or whether it ought to be called "The Squadron of Death." The latter name was voted down. To them it sounded too dramatic, and one of them said, "Who expects this to be a Squadron of Death? We're all experienced fliers—why should we think of death?" So it was "The Buzzards" from that time on, and our squadron emblem was that carrion eater himself.

A few days' practice and I was satisfied. There was not one of them whom I could shake from me. If I looped they looped, if I spun so did they, and as for straight flying, I

knew that there would be no question of the company's being satisfied. So close did they fly in horizontal front-line formation that from the ground you'd swear that their wings were touching. And when the time came for our take-off for the location we arose in a squadron and kept the formation until we landed.

Everybody liked everybody else. There was just enough divergence in tastes, dispositions, and characters to make it a congenial, trusting bunch, and one which would do anything for a squadron member.

We were a bunch of Buzzards. From the beginning until the last man alive, we said, we'd stand for one another and for the right kind of leadership, and we agreed that if there were a death among us that gap would never be filled. Perhaps, if a picture called for more of us than there were, we would fill in, but it would only be temporarily.

It was a gay bunch, and in the course of our many conferences each got to be known by some like or dislike or by some trait of personality. Lonnie Hay was called the Honey Buzzard because he liked the women, Spencer the Technical Buzzard, for he was always figuring out the aerodynamics of the game. Baker the Judicial Buzzard, Cook the Flight Buzzard, Stoffer the Jester, and myself the Chief Buzzard.

Every morning at sunrise our mechanics had the ships warmed and ready for flight before breakfast, and if anyone did not keep formation he was the butt of jokes to the rest of the flock. And a Buzzard's "razz" is a tough thing to stand.

Some of the turns and dives and stunts were difficult, but not to this squadron. Inside the length of the field they could change to three different formations, from a V to an echelon to a line.

More than that, between those seven and myself in the air and my mechanics on the ground I had reserve pilots, race drivers, parachute jumpers, high divers, and motorcycle specialists. There was nothing which you asked of that squadron that you could not have immediately.

Even Fred Osborn, who had jumped the motorcycle from the Palisades with a parachute which did not open, was among those technicians on the ground. Crippled as he was, he could do more work and produce more results around a motor in a minute than any two of the others could in an hour.

In charge of my mechanical shop I had Garland Peed. I had almost gotten down on my knees to a judge for him once to beg that the rash flier only be fined for looping around telephone poles. It cost me eighty dollars to get him out.

Field mechanics and riggers were in charge of Lieutenant H. Rouse and Sergeant Costenborder.

I was satisfied with my squadron and took great pride, not only in having gotten this group together, but in holding them always as a unit.

But the formations, the squadron landings, and take-offs were but part of the work to be done on this location. There were the crack-ups.

Up to this time I had now successfully survived twenty-six of them and that's a good many ships if you were to

have them all assembled and then say, "Now I'll crack this one up, or smack that one down." So I began to think that I knew what wrecking a plane was. Yet when George Fitzmaurice said, "Now listen, Dick, in this first crash you must go over on your back, and remember—if you go over on your back in the second one it's no good to us," I began to think that they were expecting just a little too much of an airplane out of control and of a pilot busy waving broken struts and leaping wings out of his way.

Nevertheless, I had nothing to worry about for the present, because in the first one I was to make the ship go over on its back. I thought I could oblige the director in this, having had experiences enough like it before. So I got the ship ready, preparing it much as I had those for *Wings*. Then I organized my rescue crews and put them in charge of Ross Cook and Captain Campbell. Having had them on this duty for me before, I knew that I had no worries on that score.

Then Hezi (Cullen) Tate, the assistant director, assembled all of those on troupe (totalling between three and four hundred) and gave them a little speech which ended with: ". . . and if one of you eggs starts out on that field after the crash I'll sock you over the head with this"—and he held up a big club. So I knew that I was properly policed.

Then I was shown where to crack. They had drawn a circle about ten feet in diameter, and they wanted the ship to land as near to it as possible. I looked them over rather quizzically. They weren't asking *much*—to crash an airplane at a speed of eighty-five or more and insist that it

flop over on its back on or near a circle. On my birthday at that. A few years ago, about that very same time of day, I had crashed into the world, and now *Boom!* I was apparently trying to crash out of it, for the way in which they expected me to land on the spot demanded that I come in with the wind on my tail. That alone would add about twenty miles more to the speed of the thing.

Calmly I drew a handkerchief out of my pocket. "I'll go you one better," I said. "I'll bet when the dust quiets down some part of my ship will cover this." And I had a bet.

Then followed the same old programme. Cameras were set, people placed. The fire apparatus was ready for instant use and my rescue crew stood around, each man with his particular instrument.

I did something which I had always wanted to do before. I wanted to perform a little scientific test of myself, just for my own observation. I went to the emergency hospital and had a complete physical. My eyes and ears were tested. I had the doctor take my blood pressure and I had him record my heartbeats.

In the meantime my motor was warmed. I got into the ship, made a final adjustment of the belts, and taxied it over near the camera stands. I smiled slightly as I noticed the drawn, worried faces. That ominous silence which always pervades such dramatic situations was present for me here. It is something which the camera cannot photograph, something that theatregoers miss when they see one of my actual crack-ups. In truth those on the troupe and those who see me make these thrills get more by many

times out of them than those who see them later surrounded by stories which build them to a climax.

I looked over at Colleen Moore, who had agreed to witness this one crash, and rather pitied her as she stood by with a sort of grim little expression of determination. How I wish that I could stand by just for once and watch some other pilot crawl out! I know I'd get a real thrill out of it.

They say that some people cry out as I hit, others turn their backs, still others get hysterical, and to me that's more or less of a laugh, because I'm too busy about that time to get hurt—or to think of it.

Again I received my last instructions, which were a repetition of words I had heard about fifty times. *Hit the spot!* I gave them the Buzzards' salute and the motor the gun. Off. This ship was also going to join that Squadron of Death. It must furnish wings and motors for those on the other side. I hope they'll never need ships so long as I'm here, and I don't think they will, but I do feel sorry for some of the good crates I have flown to death, and I was sorry for this one. It had the best motor of any of those on the line; it was the ship which I had used to lead the squadron. As it hummed and droned its way around the trees for the last time I should have liked to make it easy for it, but that I couldn't do. A smash-up with the wind and turning it over on its back meant—well, just to touch a match to it afterward and so put it out of its misery.

One of these days all of those dead ships, ships which I have murdered, will get together and frame on me, and they'll reincarnate their abused spirits into one and send that one back for me to crack up. Then it may be my turn

to join the Squadron. I think perhaps they tried to gang up on me when I flew the D-7 into its grave, but those friends of mine who pilot them daily got wise to the plot and sent me a hunch.

But the spirit of that ship was due to whizz through space very soon because I had rounded the trees. Coming close to the ground, I glimpsed the circle of yellow dust and got a faint flash of the handkerchief in its centre.

The next time around was the designated time, so I cut the field short and headed back. Now once more I came low. I was skimming over the tops of the hills back of the field with excessive speed. When the trees at the end of the field loomed up I deliberately bit off about four feet of their foliage with the undercarriage, as a last floral offering to that nearly dead ship.

Then I dropped it down closer to the ground. The spot was approaching, and it was time to dig the propeller into the ground. There once more was that dull thudlike sound as the stick splintered. A wing crumpled. The motor turned up in a last whine before I shut it off. I could see it bending out of its frame and back toward the front cockpit. Then we started up on its nose. For just one second we hung there balanced at the top of that reverse ground loop and I said, "Yes, it's going to! No, it's not! Yes, it is!"—and the "yeses" finally won. With a last dying quiver the ship turned over on its back. *Yes—sir!* It turned its belly to the sky and its back to the ground, and from where I was, bottom side up, I reached down and picked up the handkerchief.

XXVIII

BUZZARDS AND CRACK-UPS

WHEN I got out of the ship the doctor counted my heart-beats. There were just exactly as many afterward as there were before. I hadn't lost a one, nor had I gained any. He took my blood pressure, which also checked with the figures he noted before the flight. I began to wonder if there was such a thing in life for me as a thrill, for I certainly had not had one, otherwise there would have been a slight variation in the two medical reports.

But there was no time to dwell on such subjects. I had two other crashes to do, one a particularly hard one, since if the ship turned over on its back the shot was ruined. Incidentally, the third one was not so easy because, though the ship was not to leave the ground, I was supposed to taxi it between two trees, ripping off the wings. False wings were already under construction—wings which were light and which did not have any drift or anti-drift wires in them. Yet with all I expected this to be quite a smash.

For the present I had to think of that crack-up in which I dared not flop over on my back, and the more I figured the fewer conclusions I reached. How could I possibly give them a spectacular crash, yet avoid that one wrong manoeuvre?

Finally I thought of an angle which, though it did not insure the director's desired result, might aid in bringing it about. I went to the machine shop and unbolted the heavy anvil from the floor. Then I had my mechanics install it in the section directly in front of the tail skid. I figured that with such a weight hung in the back of the fuselage it would require much more speed for the ship to rise to the point past the vertical, for it shifted the centre of gravity of the ship much farther back than it was normally. But if that big hunk of steel ever broke loose during the crash and wrapped itself around that broken neck of mine, I certainly would receive a few scratches.

However, the thing was ready to try and so on Thursday the 12th we rolled the ship out and warmed it up. I took my physical exam and last instructions and was off.

What a feeling! Though I compensated as much as possible with the variable angle of incidence on my stabilizer, still the ship was tail-heavy; but I couldn't blame it because I know that if I had as much weight as it did where it did I'd probably be heavy where it was, too.

With difficulty I managed to fly around the field and swoop low over the spot where I was to crash. On the second time around it was necessary for me to use both hands on the stick. Once more I was coming in to crack up. The spot was but two hundred feet ahead of me. With a bad wind on my tail I could not see anything but failure for this stunt. It would be almost impossible to hit on a wing, landing carriage, or nose and not turn over. However, I had no intention of striking on these points because if I

did the ship would not stay upright under any conditions with enough speed.

Instead, I raised the nose of the ship until it was about a hundred feet from the ground. Then I kicked the left rudder and shoved the stick over in the same direction. I was taking advantage of the knowledge which I had gathered in that accidental crack-up years before when I had been forced down the side of a cliff. I was going into a side slip.

It was a real one, my wings being almost vertical to the ground. And if you don't think it's a peculiar sensation to see the earth approach you and the side of the fuselage, ask any pilot who has had to slip a ship into the ground. But my eyes were on a particular spot—the yellow circle. The ship was just a little behind it and it looked as though I were going to miss it altogether. However, I had forgotten to calculate the full force of that wind on my tail. I watched the wing crumple into the fuselage and into the motor. I felt a keen pain in my left side as the nose hit.

Then that ship did a peculiar thing. Standing almost vertical, it made a complete spin, or ground barrel roll, on the crankshaft and then slid backward for more than fifty feet.

If I thought I got a sensation when I saw the ground approaching me from the side, it was but a beginning to the thrill that I experienced when that airplane went into reverse. As a matter of fact, I didn't have any idea that a ship could be made to do such a thing, and my thoughts were divided. Would the motor break through and land on my lap and was I going to be able to stop near that circle

of dust? Of one thing I was certain. That anvil in the back was certainly holding down the tail.

It was all over now. Another ship had passed into the hands of the Squadron. All four of the spars in the left wing were broken, the linen was torn and crumpled. Naturally the back of the fuselage received as much damage as had the motor and propeller, for in that short flight backward it had taken a lot of punishment.

Again I was fortunate. The wreck was not on the yellow ring, but it was so close to it that I was satisfied. So, incidentally, was George Fitzmaurice.

Colleen Moore came to me afterward and said that she had never witnessed anything which had thrilled her so much, and which at the same time so frightened her; but I guess Colleen forgot that that was my twenty-eighth crash.

But just about that time *I* began to realize it. That sharp pain I had felt when the motor hit the ground once more asserted itself. My chest was sore, and it became painful for me to breathe. So I went to my quarters and stripped to the waist. With a little extra pressure on certain ribs I found my first hunch correct. A couple of them had broken from the jolt I received as I slammed up against the safety belts.

I got the squadron together and told them that I had to go back to Los Angeles, and asked them to continue under the leadership of Ross Cook until I got back. That's the advantage to the commander of a squadron in having a capable flight lieutenant. I knew that the Buzzards could and would operate efficiently during my absence.

Subsequent events proved this to be so. Every morning they went through their manœuvres. All formation continued for the picture while I was away, and one of the greatest things that a squadron could do for a leader they did for me.

My third crash was due. That was the one for which I was getting very little money because the plane did not have to leave the ground. Yet there was a considerable element of danger in it, because the fake wings were unbalanced and had no ailerons. And if the ship bumped into one of the trees instead of going between them the pilot was sure to be injured.

When the Buzzards saw that I was not going to be able to return in time for the picture's needs they held a conference. This thing had to be done; it was up to them to see that it was. So they all drew straws and the one having the shortest was to do the stunt. And from all reports it was not a question of forcing anyone to draw. They all wanted the opportunity to do this for the squadron. Stoffer, the Jester, was the lucky one. And when the time came he carefully set the ship back at the designated spot. Then, getting in, he did not ease the gun to that motor. He just naturally gave it all it would take. When he passed through the trees he was making a good fifty miles an hour, and what there was left of that ship no one could use. Stoffer had also sent one down to the boys to use.

But the crack-up of crack-ups on that location was an accident.

All during the time that we were on the location the owner of the land had begged for a ride. Either we were too busy

at the times he was present or the ships were being used as background for other scenes and so my squadron was not available for passenger service. Moreover, I had built all the ships into single-seated fighters except one which we kept for emergency use. Baxter, however, had brought his own ship to the location in the meantime, and this was the one opportunity that the owner of the land was looking for. So he begged Phillips to take him up in it, and after the proper consent was received Phillips loaded his passenger into the front seat and strapped himself in back. As it was nearly dark Phil did not take time to remove the control stick from the front cockpit, but took off for what he figured a very short hop.

It was shorter than he figured. Hardly had they gotten off the ground and out of reach of the flying field than the passenger found the controls, and never having been in a ship before he just shoved them out of the way, so he could see better over the side. That was the end of that flight. The ship nosed into the ground and went over on its back so quickly that none of us started running until it was all over.

Neither was hurt, but while they were still upside down the one in the front seat hollered back to Phillips, "Hey, is that all there is to it?"

"What do you mean, all there is to it? Isn't a crack-up enough?" Phillips said angrily.

"Crack-up? You mean this ain't just part of the stunt, then?" And Phillips broke out into a string of strong adjectives which have no place here nor there.

After our work on the location was finished we had a

real test of our ability to fly, for we got to those sequences which required a concentrated attack by my squadron of seven R. A. F. planes on a regular formation of nine Germans. That meant that I had to organize another unit. This would naturally seem a difficult thing to do on the spur of the moment, but with the organization which I had it was really quite simple. Altogether I had eight men, including myself, on whom I could depend for good formation work. I split these fliers into two groups, one headed by myself and one headed by Frank Baker (Ross Cook assuming an important position in the German formation which I led). Then with such other good fliers as I could find I filled up the gaps in both units, and on our first flight we had two of the prettiest squadrons that I've ever seen.

And could they fly? In close formation we had to fly up through the clouds every morning for weeks, and during that entire time there were no accidents or near accidents. This is phenomenal when you consider that nineteen ships (including three camera planes) would climb through that bucket of milk that blanketed the earth to the sunlight above before they even started the daring mix-up.

It was interesting and exciting. Sixteen ships all milling around—diving, looping, spinning. Bursts from machine guns and the hum of roaring motors filled the air. These boys were really fighting, getting a touch of the same thing that a majority of them had had years before. Never did you see one ship alone. They all singled out an adversary and got on his tail until he himself was driven to protection. Ships went down in flames, others actually dropped

out with a missing, spluttering motor. Nor did those of us in the battle pay any attention to forced landings until I fired a red signal from my Very pistol.

It would all cease as suddenly as it began and we would race with each other to the field. There were no formations on the way back—it would have been a waste of time. Most of us just put the ships into a spin through the clouds, and came out only when the earth again became an actuality.

Sometimes I would stay up above for a few minutes to admire the other existence. There was no earth now, for around and below me were only clouds. It had always been a source of wonderment to me—this outside of the earth. And you are outside when these pillars completely block vision of water and land.

Up there also exist cities, with their avenues of clouds and their star scrapers. Often I have flown down these avenues only to find them blind. When I turned around I would discover that a huge high building had moved itself directly across my path and I'd have to move quickly so as not to be caught in the swirling mass. Some of them rise so tall and have such well-defined sharp corners that I get a thrill out of hitting them. In the imagination it is the same as crashing, for at the very moment I hit their edge I expect to hear that crunching, grinding sound that accompanies my deliberate crashes. Perhaps I have learned something of crack-ups from these cities of clouds, with their ever moving and ever changing streets.

But they are not so different from our earthly cities. Down below also old buildings are torn down, old land-

marks removed, and in their stead are built bigger, taller skyscrapers. The main difference between Cloud Street and Broadway is just the element of time it takes to make the transition.

Once after dropping through the clouds from one of these air battles I flew upon a buzzard. I don't know whether he heard me or not but I rather think so, for his awkward old wings were flopping as hard as they could. Ordinarily you can watch them for hours from the ground and they don't move a wing tip. Well, I wanted to say "hello" to him and I wished him to tell all of the little buzzards that I had a plane in my squadron named after every one of them, but he just turned his gawky ugly head toward me long enough to see this new giant who had come to usurp his kingdom and then he put forth his best efforts to get away.

For some time I played formation with him and then, as if to show him a little bit about flying, I went into a loop. I'll bet I wake up some morning with Papa Buzzard and all the little buzzards around my doorsteps waiting for instruction in stunts.

It was during this period that Frank Baker, the Judicial Buzzard, and I put on the duel for the two principals of the cast. For more than a hundred hours we zoomed and dived on each other. We looped and spun. One Immelmann followed another as we crashed at each other from opposite directions, sometimes missing by a matter of inches. At first we tried to arrange all of the manœuvres on the ground, but we found that after we ran out of our prearranged stunts we had not even started a good battle, and so we

mixed it up as if it were real. Sometimes he would get on my tail, and when he did he was the hardest man to shake I've ever been up against, and when I'd get him in the same position I would pump him full of the dummy machine-gun bullets.

Every time the squadron ships had to be filled with gas Frank and a camera ship and I took off, hunted a cloud location, and did our private dog-fighting.

It was after one of these flights that we came down to find the squadron almost ready for us to take off. Just a minor adjustment had to be made on one of the ships that was supposed to burn up. In order to get this effort we had thirty-six separate smoke bombs grouped and fused together in a steel pan on the bottom of the ship. From there to the seat an electric connection was installed so that when the pilot closed the switch the bombs would immediately throw out a cloud of smoke and fire. To all appearances, even from the ground, the ship was doomed.

In the seat of this "fire" ship sat a mechanic, who was busy installing the very last of the apparatus necessary for the next flight. The bombs were placed, the wiring connected. He was just about to give word to a fellow mechanic to twist the prop when the assistant director called to him.

"Mechanic of the fire ship!"

Immediately the one called jumped from the plane and went over to the assistant director.

"Yes, sir," he reported.

"Is your——"

Boom! With a terrific hiss, accompanied by a slight ex-

plosion, the ship was a mass of flames. Evidently the wiring had shorted. Certainly it was a close call for the mechanic. If the assistant had not called him just when he did there would have been a body in that fire of gas and powder. The mechanic turned to the assistant director.

"Pardon me," he said, "were you about to say something?"

XXIX

WOULD I DO IT? WHAT A SILLY QUESTION!

IN MY selfish interest in my own work I forgot to mention what had happened to others in the game. A woman was drowned doubling for the feminine lead in a prominent Western star's picture. Following this two doubles were drowned trying to run a whirlpool in a river in Arizona.

Al Wilson's motor almost pulled out of his ship and he had to jump in a parachute. It was one of the closest calls that this daring stunt flier and aërial acrobat has ever had.

One more was added to the Squadron of Death when Al Johnson hit high-tension wires and was burned to a crisp, just before he was to do a stunt for *Hell's Angels*.

A snowslide killed one, and two more were injured when a director blew up the mast of a ship for an historical epic.

Bob Rose broke his arm while doubling for Alice White out at First National. It seemed to be striking all along the line.

Pauly Malvern took a nasty fall (about eighty-five feet) and was forced to retire.

I alone was fortunate. Directly from *Lilac Time* I went on *The Air Circus* and there again performed crack-ups. Before I did the second one, just one hour before, a com-

mercial pilot took off from Glover Field, where the picture was being made, and five minutes later he crashed into the ground and was killed.

But these deaths had no psychological effect on me. I was immune to every sort of shock. At least I thought I was. Immediately afterward I took off and smacked an OX5 into the rigs of its JN-4 and walked out as usual.

A couple of high-ranking navy officers came in to see the stunt and they rather marvelled at it, and asked me if I'd do them a favor and crack up some of the crates that they didn't like. I thought of the old equipment which slopped up the air at Pearl Harbor, T. H., and replied that I thought they had some ships that were too old and decrepit even for crashes.

While I was on this picture I met a star who thought she liked me a little bit, though in reality it was because of the crashes she had seen me do. She was not in *The Air Circus* but was a guest of one of the cast that day. When she left she said that she didn't think that breaking my neck had hurt my necking, which I thought was a dirty remark until I knew what she meant by "necking." Hicks from Hollywood like me sometimes go to New York to neck at the skyscrapers or the throngs on Broadway, but I guess some of these Hollywood girls don't need a crowd or a skyscraper.

Life seemed to be just one crack-up after another for me. After *The Air Circus* I was engaged to do the aviation work for *The Big Hop*, and although there was no crack-up scheduled I dragged one in.

In between the shots of the big cabin ships we were

using I had to carry newspaper people who were invited for "hops" by the publicity department. While in the air with two of these (both women) the company started to shoot another scene. We watched them from above, and it was really amusing to see those ants far below, crawling from place to place or running in one direction or another with no apparent reason or purpose. Now I can understand the busy scramble of an ant hill. Those little fellows, too, have reasons for rushing about.

We came in in a slow glide, and to all appearances the field was clear and unobstructed. But as we slid over the telephone wires at the end of the field a camera car unwittingly approached under my wing at a blind angle and I sat right down on top of it!

Well, there were four in the automobile and three in the ship (including me) and I was the only one who got a scratch. Again I hurt the rib that had been injured in *Lilac Time*.

We continued to work and finished the picture before sundown that evening, and I sent the planes to their different hangars. Then I went home and tried to get some of the oil and dust out of my skin. While I was peacefully enjoying the luxury of the hot water the telephone rang. At first I did not answer, but it was insistent. Finally, more or less outraged to be disturbed at such a time, I clothed myself scantily and answered it.

"Hello, Dick," came the voice at the other end of the wire, "got bad news for you. Frank Baker was killed on his way home to-night. Tried a barrel roll five hundred from the ground. Something went wrong—never came out!"

Almost mechanically I hung up the receiver. This was the first time that the Old Man had struck into my squadron of Buzzards to add to the ranks of his Squadron of Death.

But it was not the last. Crossan, who had been held as a relief pilot, flew down to Imperial Valley to give instruction in stunts.

"Now I'll show you how to do an Immelmann turn," he said to the student before he left the ground. And he did. When he went over on his back his wings left the ship, and of course he flew right on and still is if he hasn't arrived at those gates asking admittance to the Squadron.

With this blow just accepted and fixed in my mind, there came the word that Baxter had also died in the cockpit. After he finished *Lilac Time* he took his ship to Texas, and it was while instructing a student that the latter "froze" the controls. As hard as he tried, Baxter could not right the ship before it plunged nose first into the ground.

Now I realized the hunch that had made me want to call this the Squadron of Death. Long before when we were quartered in our tents for the night we would get together for a conference before retiring. Then I would look them all over and wonder which one would be the first to get it. But I did not think that three of them would join those on the other side within such a short span of time. I felt as if the Old Man were playing me a dirty trick. Why should he pick on my squadron all the time? There were other aviators, other ships to crash. Three of them gone—three

empty places never to be filled in that squadron of Buzzards.

Then shortly after I finished *The Big Hop* Phillips went with *Hell's Angels*. Phillips was one of my best pilots. There was nothing he couldn't and hadn't handled from Reginald Denny's "Snipes" to the new tri-motored Fords.

In this last picture he was flying an old SE-5. He had made short landings on tough fields, and forced landings on rough ones. Yet one morning when he was flying from one field to another, preparatory to the day's work, the motor quit. With his usual skill he slipped into a small field and found that he was almost out of gas. He put some in the tank—how much no one seems to know. Then once again he took off. But his motor spluttered when he was making a climbing turn. It quit. The ship fell into a dive from which it never came out.

Some think that he was still shy gas, others that he had motor trouble, but what difference does it make?

When people ran to the wreck they expected to find a mutilated body—cut, bruised, and disfigured. How surprised were they to find that apparently he had not been scratched. He just sat there with his head forward as if in a daze or as if he were unconscious.

Dragging him from the wreck, they put him on the ground. He was not breathing. There was no sign of life. He was dead. His neck had apparently been broken, either by some object which hit him in back or from the sudden snap forward. I knew what that felt like. I knew how little he suffered, for he had an advantage over me. When he

broke his he did not have to live through that slow, painful process of getting well.

When I heard that the fourth out of my eight had deserted me it was almost too much. Fifty per cent. of them in a little over six months. At that rate within a year there would not be one of us to claim that piece of parchment, with our signatures and positions on it, which the last one living was to own. And I thought I was immune from all personal feelings, that no one person's death could affect me. How wrong!

At nights again I could hear their voices, see them in a group razzing and bantering each other. I could feel their presence everywhere about me. Suddenly a favorite expression of one of them would pop up in my mind and I'd probably use it for a whole day. My dreams at night were filled with their gaunt faces. And it seemed as though they jibed and chided me for lingering so long behind. A mass of them returned nightly. It included all of that Squadron of Death, but invariably there were Baker, Baxter, Crossan, and Phillips in the lead. There also were Gene Perkins, Bud Creeth, Dick Curwood, Locklear, Delay, Burgess.

My mind was troubled. I could find no peace. I was alone. Now only Ross Cook, Stoffer, Hay, and Spencer were left, besides myself, and I knew that they also were feeling the pressure of the staggering total. This was one battle we had lost. Never had one of us been killed in formation or when we had worked as a unit. But that scythe had cut us down when we were separated.

Spencer went to the hospital with severe head injuries occasioned by an accidental crash. He was not expected to live. A frontal fracture of the skull—marred for life. Well—just another miscalculation.

I was sick with it all. Not of flying. I was flying harder than I ever had in my life. Work was getting more and more difficult. Technique was required in crashes which only a stroke of luck could accomplish. Yet I wanted a rest. I had had but that one short week with Georgie Smith.

Then Garland Peed was killed back East, so Alice White told me. The Buzzard whom I had gotten out of jail left without a good-bye, and incidentally he flew into those gates still owing me eighty bucks. I suppose when I join I'll have to get him out of some trouble down there too. He just couldn't get along.¹

And about this time I received a letter from my father:

MY DEAR SON:

I sincerely hope that you are progressing nicely in your chosen profession. We, your mother and I, have all the confidence in the world that before long you will have reached your goal.

But it is with sincere regret that I note that you do not want to finish your university education. That is one of the few things which you cannot lose and which cannot be stolen from you.

It was my secret ambition for you to follow the study of law, and to eventually take up my unfinished work. But God had other plans for you. I have retired, as I have so often threatened, and of course the practice which I enjoyed is going to waste. Why don't *you* retire now from what you call your "game" and resume the study of law? There is my library, and the benefit of my experi-

¹As the book is going to press, Captain Grace from a hospital bed asks us to say that he has since learned that Garland Peed's injuries were not fatal.—THE PUBLISHERS.

ence at your command—also what small fortune I have saved. As your two brothers are professors, you are the only one whom I can call upon to carry on my work.

Therefore consider very thoroughly, and endeavor to please me just this once.

Sincerely your father,
R. H. GRACE.

Well, I thought that letter over for hours—days. After all, this game had given me nothing but body breaks and heartaches. Why continue?

I sat down and figured. It would take me three and a half years to get my two degrees—a B.A. and a LL.D. What could I accomplish here in the same length of time? Already this Hollywood alone had taken nine years of life. I had enjoyed it, asked for it, but as far as advancement was concerned I was just as far ahead at this time as then.

My trunks packed, I did not even fly home. I took the train. At the station I was met by my father and mother. It was the first time I had seen them in ten years. Not since I came in uniform had we so much as glimpsed one another. Perhaps I felt more intensely then than I have in all of these years of stunts.

For two weeks we talked over old times: my youth, my pranks. I visited with former school companions, we went to our old hangouts. I hunted and fished—and it was a good vacation. But it was just *that*. I grew restless, wanted to go somewhere. The beautiful sunsets, the serenity of the quiet life were too much of an extreme, I told my father

that I'd wire my answer to him from New York—the answer to the same old question: Would I continue the study of law?

But when I got to the big city again and visited my friends I knew what that wire would say.

Two weeks in and around Broadway and then came a special air-mail letter. The part that interested me was as follows:

For a month we have been trying to locate you to produce the thrill for our next picture. Perhaps the risk will be too great for you to undertake, but here is what we want: An airplane motor quits over the centre of a big city. It is necessary for the pilot to land. No available space can be found, so the pilot must crash on the top of a building—preferably one of some height. Can you do it for us? Wire immediately.

Sincerely yours,
ADVENTURE FILM CORP.

Now why hadn't I thought of doing that before? I believed that my crack-ups in *Wings* eclipsed anything I might ever attempt—but this one? Well, it was a real man-sized crack-up. Would I do it? What a silly question!

My trunks were packed and checked that same day. Late in the afternoon I grabbed a train. I was on my way to Hollywood for my thirty-second crack-up. What could compare with the thrill and excitement of the game? And I thought I could leave it! Then I realized one thing. I could never leave it! I was broken in to it. It might be a game, it could never be called a profession, but it was my game, even if it offered no future.

I sat down and wrote the following note to a friend of mine in the New York I was speeding away from:

DEAR N——

I don't want to be a lawyer. You know I never will. Am sorry for my friends and my father—but then, this is something which I have also worked to a nicety. I don't know law; I do aviation and stunts. Therefore I go back to the work I know and like. And I'm as full of pep as a spring chicken with a prairie hawk on its tail. You think not? Well, you ought to see me try to sit still long enough to write to you. I tell you I've got motors in my pants that just keep shoving me on toward that good old field, and to those crates locked up in the hangar.

Sort of glad I took Mrs. A. M. W.'s and your advice and wrote this partial history of stunt men. They're a great bunch of boys, both those in my squadron and also those who fly in the Squadron of Death.

I wonder if Georgie Smith is married yet. You remember her? Well, she certainly crashed me up nicely. I fell like nobody's hours off.

Yours for happy landings,

DICK.

P. S. Did I forget to tell you that Red Thompson, who forced that Arab horse of his off the cliff, was drowned trying to swim rapids in a picture called *The Trail of '98*?

R. V. G.

THE END

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CHAPTER XI

LATER POLICIES

Power Development of Canal Waters—Charing Canal Waters—Blue Line Surveys—Sale of Abandoned Canal Lands—Sale of Appropriated but Unnecessary Lands—Sale and Use of Excavated Materials—Rome-Mohawk Section—Cemetery Lands—Advisory Board Abolished—Toll Bridges—Retention of Old Canal near Waterford, also near Schuylerville—Maintenance Equipment—Reorganization of Operating Forces—Prize Lock—Maintenance of Rochester-Lockport Water Level—Protective Laws—State Towage—Faithful Performance Bonds—Contracts under War Conditions—Terminal and Navigation Rules—Attempted Federal Jurisdiction—Reorganization of Engineer's Department—Terminal Organization—Terminal Charges—Amendments to Terminal Law—Wharfage Fees Remitted—"Finish the Job"

AT THE beginning of Barge canal construction there were many questions to be decided besides those dealing with the proper design of channel and structures and the multitude of similar matters of a more or less technical character. In our study of the canal these other topics, which are concerned with policies, methods and the like, are treated apart from events which have had to do more particularly with the work of actual construction. While the larger questions of policy and procedure necessarily had to be decided early in canal construction, there have been numerous matters of similar nature throughout the whole period of building the canal. These later subjects make up the present chapter and of necessity they are not very closely connected.

Of the later policies the first in point of time to be considered by canal officials was that of developing and disposing of power which might be derived from surplus canal waters. As a matter of fact this problem received attention almost as soon as construction began, but its solution is an event of very recent date, if indeed it can be said to have been fully and finally solved.

As early as 1905 State Engineer Van Alstyne called the attention of the Legislature to the possibility of developing power at the many dams which would be built in canal construction. In the past the State had built dams for its canals and at these dams water-power worth millions of dollars in the aggregate had been generated, but in nearly every instance it had been private individuals

or corporations that had acquired possession of the power rights and had used them without making any adequate return to the State. It was to prevent such an outcome with respect to potential Barge canal water-power that the State Engineer made his appeal to the Legislature, counseling a careful guarding of the State's interests.

Through all of the years from this first recommendation until 1921, when a State water-power policy was adopted, this question of utilizing surplus waters has been most prolific of thought and discussion. In nearly every annual report the State Engineer has given it lengthy consideration, while the Superintendent of Public Works has discussed it in many of his reports. Not only these officials but others have grappled with the problem, or rather with the larger problem of which the canal question is simply a part. This larger problem—the whole broad subject of utilizing the State's available water-power in general—was under consideration and many persons were trying to evolve a policy which would safeguard the State's interests and at the same time would be fair to power companies and also present opportunities sufficiently attractive for the companies to accept. Furthermore, water-power utilization is in turn only a part of the still larger problem of conserving all natural sources of energy. The days of canal construction have been also the days when the theory of conservation of natural resources has found ready acceptance and general recognition among us. Since, therefore, such far-reaching and all-important questions were more or less at stake in the proper solution of the canal water-power problem, it is scarcely to be wondered at that progress has been slow. In 1907 the Legislature provided by chapter 494, which became section 16 of the Barge canal law, that canal waters should not be leased, sold or otherwise disposed of until the canal should be completed nor thereafter until authorized by a statute which should specify conditions and restrictions to govern such lease or sale.

In 1909 another amendment to the Barge canal act (chapter 273) empowered the State Engineer to take possession of lands, structures and waters "for the utilization and full control by the State of the waters impounded, created and to be discharged as the result of the construction of any dam, mole, reservoir or other structure as part of the improved canal system." This amendment was evidently in response to a recommendation by Superintendent of Public Works Stevens, its purpose being to provide for the acquisi-

tion of whatever was essential to the complete control by the State of its canal waters.

In 1909 State Engineer Williams advised action which would allow the use of about six thousand horse-power at each of two large Barge canal dams, those at Vischer Ferry and Crescent, which would go to waste for several years if not utilized till the whole canal should be completed. The cities near these dams took up this cry and for years the Capitol District, as it is called, echoed the demands for power from these sources.

In the official recommendations of recent years there is apparent a deeper appreciation of the need of solving the whole water-power problem of the State rather than the canal question alone. Thus we read in State Engineer Williams' annual report for 1917, "State officials and others who have given the subject some thought agree that a strong, definite policy should be adopted in treating the broad question of power development and flood control in the rivers and streams of the state. I am strongly of the opinion that the State should not embark in any proposition of this nature or become a party to any undertaking until the many varied and complex problems which are involved have been approached from all angles and solved in such a way as to insure the greatest ultimate benefit to both the State at large and its citizens."

But in spite of these evidences of a general realization of both the complexities of the problem and the need of a complete water-power policy, the canal officials and the public at large appear to have been impatient at delay and continued to urge the immediate use of canal waters. And their reasoning seems good. The dams were already built and the power was going to waste. As Mr. Williams pointed out, long-term leases could be so drawn that they would safeguard canal interests, allow the use of surplus waters, thus assuring additional State revenue as well as additional power for industrial purposes, and at the same time not interfere with any general water-power policy the State might thereafter adopt.

A list of Barge canal water-power possibilities, compiled by the Superintendent of Public Works and published in his 1919 annual report, shows the following conditions: At Crescent, Vischer Ferry, Rocky Rift, Caughdenoy, Cayuga, Clyde, Lock No. 1 on the Champlain canal and Crocker's Reef the State owns the whole flow of the streams, but no development has been made. At Fulton the flow is owned partly by the State and partly by outside parties and the power has been developed. At Minetto the State owns

the eastern half of the river's flow and the western half is developed. At High dam, near Oswego, the flow is owned by the State, but has been applied for by the city of Oswego; the power has not been developed here. At Rochester the flow from the canal into the Genesee river and certain rights in the river are owned by the State; the power has been developed. At Medina the flow is owned by the State, but its use interferes with navigation interests; the power is developed. At Lockport the flow is now under lease and permit to water-power users; power has been developed here. At Northumberland one-half of the river flow is owned by the State and there is a partial development at this location. At Whitehall the whole flow is owned by the State and power has been developed.

In 1921 the State adopted a definite water-power policy, largely through the efforts of Governor Miller. The new law created a Water Power Commission and gave this Commission the authority to issue licenses for the development of power at places where the State owns the power rights, the license carrying with it the privilege of using such water-power upon the payment of equitable rental. The enactment by Congress of the so-called Federal Water Power Commission bill made the speedy adoption of a State policy almost imperative and probably had considerable influence on State action at that time. The original law placed Barge canal power projects under the jurisdiction of the new Commission, but required that before any of them could be developed the Superintendent of Public Works must certify that such development could be accomplished without detriment to transportation on the canal. Applications were made to the Water Power Commission for privileges to develop certain Barge canal powers, but the Superintendent would not make the necessary certificate to allow the applicants to proceed. He took the stand that the execution of a certificate of this character would constitute a relinquishment to other agencies of that control of canal waters which is essential for carrying out the duties and obligations imposed upon the Superintendent of Public Works by the Constitution and the statutes of the State. It would be better, he held, that canal waters should run to waste than that commerce should be crippled. The experience of the past had shown that, once privileges to use canal waters had been granted, even under provisions of revocation, it was next to impossible to discontinue or restrict such use. Since the development of canal water-powers was thus blocked, the Legislature of 1922 took the control of canal power sites out of the hands of the Commission and gave it to the Superintendent of Public Works. The new act

constituted a State policy, applying to all potential power developments of canal waters. To begin the work one million dollars were appropriated for building power plants at the Crescent and Vischer Ferry dams. Under the act the Superintendent is empowered to sell any surplus electric current not needed by the canal or State structures adjacent to the canal.

The next subject to engage our attention is that of making charts of the canalized lakes and rivers which form so large a part of the Barge canal system. In 1909 State Engineer Williams told the Legislature that the time had come when provision should be made for preparing and printing such charts, since canal traffic would soon be turned into certain river channels. So radical were the changes in navigation in the new canal that it was absolutely necessary that boatmen should have charts. The Barge canal law contained no authorization for making charts and so the State Engineer recommended action on the part of the Legislature. A bill for this purpose in the 1910 Legislature failed of passage. In his report of this year Mr. Williams again referred to the subject, but recommended that attempt be made to induce the United States to undertake the work. This recommendation was heartily seconded by a similar one from the Superintendent of Public Works in his report of the same year. The Barge canal adjoins Federal waters at so many places that a uniformity in charts was deemed advisable and moreover the United States already had an organization, called the Lakes Survey, at work charting the adjacent Government waters, and it was the extension of this survey to cover navigable lakes and rivers of the State waterways that Mr. Williams was seeking. State Engineer Bensel continued this policy and in 1911 secured Federal cooperation. As a result the Government has made surveys and prepared and printed charts and offered them for sale, just as it has done with respect to Federal waters. These charts, however, include only such parts of the canal as lie in waters which are considered naturally navigable, but even at that they cover a large portion of the State waterway. But later other charts were issued by the Superintendent of Public Works. In 1915 he found it necessary to do considerable work in marking the river channels by buoys and lights and in the same year he began making charts, these showing particularly the location of each light, buoy or other marker. This work he continued until the whole extent of the canal was covered, land lines as well as river channels.

An important policy adopted in 1909 was that of making what are known as "blue line" surveys. On the maps of the original State canals the line showing the boundaries of lands acquired by the State for its canals was shown in blue ink. The custom of referring to this as the blue line is now of such long-standing that the term has come to be synonymous with canal land boundary line.

It was on the recommendation of State Engineer Williams that this blue line policy was adopted. In 1909 he suggested it. Since the State owned valuable property within these lines and the descriptions of much adjacent property depended on them and since also it would be almost impossible to retrace the lines after old canal banks and structures should be obliterated, the need of immediate action was apparent and the Legislature responded to the appeal and made an appropriation to begin the surveys.

In reporting on this work Mr. Williams said in his 1910 annual report: "In response to my suggestions you made appropriation to begin this work, and most wisely, it seems to me, for the need was very urgent. When it is realized that never, until the beginning of Barge canal operations, have State canal property lines been suitably monumented and that in many places no map since that of 1834 may be relied upon as authoritative in courts of law, the importance of the work is appreciated. When it is further realized that the State lands within these bounds have become very valuable in many localities and that much valuable adjacent property depends on these same lines for description or starting point, and that an alteration or destruction of existing canal banks and structures, before the 'blue line' should be rerun, would doubtless result in endless litigation and probable loss to the State, the necessity for continuing this work to the end will be seen."

As funds have become available from time to time these blue line surveys have progressed. They are as yet not entirely completed. After surveys have been made, maps have been prepared, and these maps have been submitted to the Canal Board for approval.

Closely connected with the subject of surveying canal property lines is that of disposing of such of the property itself as would not be needed for canal purposes after the new canal should be put in full operation. The need of proper legislation to provide for the sale of these old canal lands seems to have been brought to public attention first by Superintendent of Public Works Treman in his annual report of 1911. The State Constitution prohibits

the sale of the canals, but under the Public Lands law the disposal of lands no longer necessary for the canal was permitted and for years such lands had been disposed of, only small parcels, however, ever having been involved. But it was considered that the law as it stood did not apply to long stretches of canal, and the portions of canal which eventually would be abandoned because of new alignment were long in extent, hundreds of miles in fact.

Aside from the value of these lands and the advisability of putting them to some use, it was not wise for the State to be under the expense of maintenance or to be liable for damage suits, which were sure to come, or for the menace to health which an unused channel would probably cause.

For several years the Superintendent reiterated his recommendation and the State Engineer joined him in advocating the policy. In 1914 legislation was introduced but not passed. In 1916, however, the Public Lands law was amended (by chapter 299) and thereafter the Commissioners of the Land Office could dispose of such portions of the old canal lands as the canal officials had formally declared to be of no further use for canal purposes. Considerable amounts of these abandoned lands have already been sold. The stretches in the cities have been bought largely by the cities themselves and have brought good prices, the city of Rochester for example paying more than a million and a half dollars for what it secured. A plan has been adopted of dividing the land into parcels of such extent as best to fit the needs of prospective buyers, in order, if possible, to sell all the parcels and leave no isolated pieces in possession of the State.

There were other canal lands, however, for which legislative provision had to be made. In 1909 an amendment to the Barge canal law (by chapter 244) provided that in the event any piece of land appropriated for Barge canal purposes should be found not to be necessary for such purpose, after certain procedure it should be returned to the owner from whom it had been taken, together with a quit-claim deed. The terminal law was amended in like manner by chapter 488 of the laws of 1915.

In addition to lands the State occasionally came into possession, by reason of new canal construction, of certain materials for which it had no use. An amendment (chapter 320, Laws of 1909) to the Barge canal law permitted the Superintendent of Public Works to sell "any materials found in deposit or otherwise during the

progress of the improvement." In 1915 (by chapter 570) this amendment was added to and the Superintendent was authorized to allow any county, city, village or town to remove these materials encountered in canal excavation and use them for constructing or repairing highways without compensation to the State.

One portion of superseded canal which has given rise to considerable legislation and also to several constitutional amendments is that lying between Rome and the village of Mohawk. By provision in the terminal act this stretch was to be retained as a part of the terminal system. It was to be kept in a navigable state, but the size of its channel was not to be increased. New junction locks at either end, however, were made necessary. After these locks were built and the new canal in this vicinity was in use, it was attempted to keep open this old section of canal under the new conditions. But this attempt was unsuccessful and the reason was that sufficient water to fill it was not available. At least it was not available from the existing source of supply. The old canal level between Utica and Syracuse was a summit level, which was fed principally from the Adirondack reservoir supply, coming in at Rome, and from the reservoirs south of the canal and west of Rome. The new channel crosses the old canal at Rome, but its surface is several feet lower than that of the old waterway. Thus the sole feeder of the thirty-mile stretch of old channel between Rome and Mohawk was Oriskany creek, and the flow in this stream would not fill the canal to a navigable depth. After nearly two months of vain endeavor to fill the canal, men having been stationed continuously at the feeder gates and every device for husbanding the supply having been tried, the Superintendent of Public Works came to the conclusion that the task was physically impossible and called upon the State Engineer to study the situation and suggest a remedy. From his study the State Engineer determined that the flow which might be expected from Oriskany creek was entirely inadequate and other means must be found to supply the need. Two methods were suggested. One was for electrical pumps at Rome, water to be pumped from the new channel. This scheme was estimated to cost \$30,000 for installation and \$22,000 yearly for operation. The other method was the use of a dive culvert under the new canal at Rome, connecting the stretch of old canal in question and another portion of old canal which extends to the west on the other side of the new channel. This section of old canal to the west, now joined to the new canal

by a junction lock, is being retained for two reasons — it is needed to connect the Black River canal with the new waterway and also it brings part of the Adirondack water-supply. The probable cost of the proposed culvert was set at \$50,000.

To complicate the situation two other factors had entered into the problem. Eight lift-bridges spanned the old canal in Utica and one in Ilion. Previous to 1917 all save one of these bridges had been operated at the expense of the municipalities, but because of the wording of the terminal law, which reads, "The present Erie canal between Rome and Mohawk shall be retained at not less than its present dimensions, and all structures, locks, bridges and docks thereon shall be maintained and operated by the State for terminal purposes," the city of Utica refused longer to pay these operating expenses. To assume this burden meant an added \$5,000 of annual State expense.

The second factor was a proposed constitutional amendment which would permit the disposal of the old canal between Schuyler and Third streets, Utica, provided a sufficient flow of water should be maintained between these points to feed the portion of old canal lying to the east. In the form of a concurrent resolution this proposition had been passed by the 1917 Legislature, even before the problem of feeding the Rome-Mohawk stretch had much more than presented itself.

The Legislature of 1918 appropriated \$20,000 for the culvert under the new canal at Rome and this sum, together with \$30,000 contributed by interested industrial companies, built the structure. This Legislature also passed the proposed constitutional amendment the second time necessary for bringing it to vote before the people and in the following fall it was approved by popular vote.

Later the State Engineer and the Superintendent of Public Works submitted to the Canal Board the requisite statutory certificates declaring that the Schuyler-Third street section was no longer needed for navigation, but the Board took no action on the matter, since it appeared that the constitutional amendment merely gave to the Legislature the right to amend or repeal the section in the terminal law which provided for the retention of the canal. While that law stood in its existing form the Canal Board had no authority to abandon any of the old canal between Rome and Mohawk. The Board held public hearings, however, and at these the abandonment of the whole stretch from Rome to Mohawk was urged. This subject came before the 1920 Legislature, but instead

of an amendment to the terminal act a measure was passed (chapter 744) which authorized the city of Utica to lower or remove any or all of the three bridges in the Schuyler-Third street section and to construct a conduit in the bed of the canal between Schuyler and Third streets. The work the city did under authority of this law constituted in effect, though not in fact, an abandonment of the old canal in Utica.

The Legislature of 1920 also took action looking toward the abandonment of the whole Rome-Mohawk section of the old canal. By concurrent resolutions it provided for two constitutional amendments. One proposed to permit the sale or other disposition of the portion lying between the village of Mohawk and the Herkimer-Oneida county line, while the other would allow such sale of the entire stretch between Rome and Mohawk. The second proposition of course made the first unnecessary, but notwithstanding this fact the Legislature of 1921 approved both of these proposed amendments and at the general election of that year the people in turn gave their approval. The Legislature of 1922 duly passed a law (chapter 341) amending the terminal act by omitting the clause which retained the Rome-Mohawk section for terminal purposes. Accordingly this portion of the old canal now passes out of use along with nearly all of the waterway which formerly ran beside the Mohawk river from Cohoes to Rome.

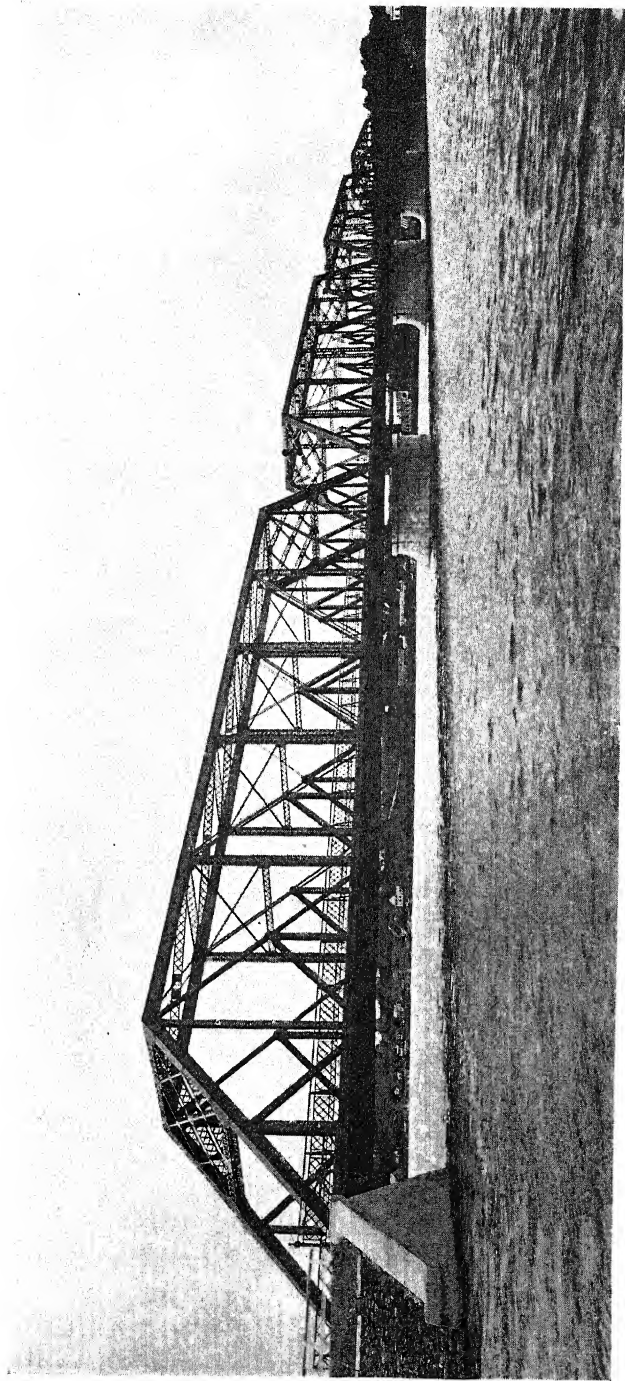
Another type of land for which provision had to be made was the cemetery. In acquiring the lands necessary for an enterprise of such magnitude as the Barge canal, especially for its great reservoirs, covering miles of territory, here and there were included small areas which had been used as burial grounds. Often these were isolated and unused, the family burial-plots, perhaps deserted and forgotten, standing in the midst of cultivated field or broad meadow. Still each one, however small or neglected, was God's acre and as such was properly protected by law. The State could not with propriety flood such lands, whether small family plots or larger cemeteries, or sink them beneath the waters of a new lake without first removing whatever remains were there interred. An amendment (chapter 63, Laws of 1910) to the Barge canal law provided, therefore, that wherever it became necessary in canal construction to acquire and use such burial grounds the State should remove the bodies found therein to other plots, to be acquired for the purpose, and that the title to such new lands should be transferred to the persons, corporations or municipalities owning

the plots in which the remains were originally buried. If persons having a right to the disposition of bodies desired to reinter them in plots of their own choosing, they were permitted to do this, but without expense to the State.

With the coming of a different political party into State public affairs in 1911 several changes in canal administration were made. Among them was the abolition of the Advisory Board of Consulting Engineers. This Board, it will be recalled, was created by the original Barge canal act and moreover by an amendment to this act provision was made to perpetuate the Board to the end of canal construction. But the Legislature of 1911 (by chapter 736) abolished the Board and in its stead the State Engineer was authorized to employ from time to time, with the approval of the Governor, one or more consulting engineers. The reason given for this action was that canal work would be expedited and the new system would operate to the advantage of the State, because the consulting engineers would perform their duties under the direction of the State Engineer and would be available for consultation at all times. In his appointment of consulting engineers Mr. Bensel retained two members of the Advisory Board and named three new men. In the working out of this law it has happened that generally one consulting engineer has been employed for full-time service and the others have been called for special occasions of a few days duration each, being paid only for the time they have actually served.

Several laws enacted in 1913, 1914 and 1915 call for brief attention. In attempting to appropriate certain toll bridges over the Mohawk river below Vischer Ferry the State was involved in litigation which caused delay and also made necessary the construction of a temporary lock at the north end of Vischer Ferry dam, at a cost of \$163,000, in order to maintain navigation. A law passed at the extraordinary legislative session of 1913 (chapter 801) directed the Superintendent of Public Works to take possession of such toll bridges as had to be altered or rebuilt in canal construction and to acquire also the franchises connected with these bridges. If a new bridge were to be built to take the place of any of these toll bridges, it should be maintained by the State and become a free public bridge.

By another law of 1913 (chapter 243) the old canal from Waterford to lock No. 2 was to be retained as part of the canal system. Included in the retained channel was the portion of the Champlain canal from its junction with the Barge canal at Waterford



Bridge across the Mohawk river at Crescent. The canalization of the river necessitated the removal of an aqueduct which carried the old canal over the stream and also a highway bridge, both only a few feet below the new bridge. Except the Schenectady-Scotia structure, this is the longest bridge on the Barge canal, 1,135 feet. There are five spans, each having a clear span of 224 feet. The old structure was a toll bridge. The State has made this free.

southerly to its junction with the unimproved Erie canal; also the old Erie from this junction southerly to lock No. 2, and in addition what were known as the Watervliet basin and the Watervliet and Port Schuyler side-cuts.

Provision was made for retaining the old Champlain canal between Schuylerville and Northumberland by chapter 412, Laws of 1914. The portion affected extended from a point immediately south of the Schuylerville waste-weir northerly to a connection with the Barge canal just north of the Barge canal lock at Northumberland. This stretch of old canal was intended to serve Schuylerville as a terminal, having been chosen by the citizens in lieu of the ordinary type of terminal. The guard-lock needed at the north end of this section was paid for out of the terminal fund. It will be noticed that by this choice no boats larger than those of old canal dimensions can reach Schuylerville.

When sections of new canal, especially the canalized river channels, were put in use, the Superintendent of Public Works found himself confronted with many new problems. The maintenance of the improved canals differed widely from that of the old waterways. Among the laws of 1914 was one (chapter 144) which appropriated funds for the purchase of new machinery for the work of maintenance; also one (chapter 145) which provided for building extra lock-gates to be ready in case of emergency. In the same year we find the Superintendent saying in his annual report that there were needed for maintenance four steel tugs, four sets of steel pontoons for raising sunken boats, six new repair shops, six dry docks, gantry tracks above the lower gates of all high lift locks, six sets of portable gantry tracks for handling smaller gates, hydraulic dredges for the river sections and a fund for painting bridges and other steel structures. In 1915 the Legislature furnished part of this equipment. By chapter 708 funds were supplied for some of the pontoons and cranes and for painting. The maintenance equipment, however, has not kept pace with the needs of the canal. All the recent reports of the Superintendent have contained appeals for better apparatus. The State equipment, he has said, is sadly inadequate and out of date. It has been necessary often to rent machinery from contractors and such practice is condemned as unbusiness-like and unduly expensive.

In 1915 the political complexion of the State government was again changed. To the office of Superintendent of Public Works came Gen. W. W. Wotherspoon, who brought to the department a

wide experience in army affairs. Several innovations were made at this time. One of the first things to engage Mr. Wotherspoon's attention was the personnel of the canal operating forces. It had been realized for some time that the old type of lock operator would not serve the new need. Lock-tenders they had been called and the very difference in name is significant. The old locks did not demand any very high order of mentality or mechanical ability, and as the positions had generally been treated simply as political jobs, rewards for service to the party in power, the usual lock-tender had been an unskilled man, often an old man, and his appointment was for only one navigation season. There were also other canal positions which required no more ability and much the same type of individual had filled them. The positions which called for skilled labor, however, and there were many of them, had of course been filled with a higher type of man. But in large measure canal operating forces had been organized on the basis of unskilled labor and of employment during only a little more than half the year.

The new locks and other structures, with all their intricate electrical machinery, required skilled operators. How the change was made and how it resulted is told by Gen. Wotherspoon in his annual report to the Legislature. He said:

"Already there has been brought to the attention of your honorable body by my predecessor, the necessity of placing the new locks, with their extensive operating apparatus, in the hands of men familiar with machinery and who could be relied upon to take prompt action in cases of emergency. It also has been pointed out to you that the people of the State may receive the full benefit of the new waterway only through its efficient operation; and such may be had only by some guarantee of a tenure of office to those found to be efficient and experienced. With the placing under the charge of this Department of many additional new locks for operation, the importance of securing an efficient operating force was manifest. Early in the year, therefore, the Civil Service Commission was consulted with the result that examinations were devised for the positions to be filled on the new locks and the holding of such examinations was widely advertised. The results obtained are most satisfactory. The new locks are now manned by young men, skilled in the various mechanical trades, and in addition to the safe and proper operation of the lock machinery, are able to make the repairs needed from time to time without any additional cost to the State. The change in the personnel of this branch of

the service has been much appreciated by canal users as navigation of the canal and the use of the locks has been placed on a definite and precise business basis. It is my belief that at the present time, the lock organization of this Department, man for man, is equal in ability to any similar force in the employ of any corporation or great business enterprise."

Another innovation was the prize lock. At the beginning of the 1915 navigation season a prize was offered to the crew of that lock which at the close of the season should have attained the highest excellence in the condition of the operating machinery and the appearance of the structure and grounds. The prize consisted in a small increase in salary to each man and the distinction of erecting a sign proclaiming it the prize lock, both of these privileges to be retained for only one year unless the same crew won again the next season. The plan was most successful. The machinery was kept in perfect condition and the surroundings were beautified, unsightly banks and the debris incidental to construction having disappeared. This plan has been continued and has worked out to the benefit of the State.

Upon assuming office Gen. Wotherspoon found that an unfavorable condition existed with regard to supplying the Rochester-Lockport level with sufficient water for navigation. Until the new channel should be completed and the supply could be taken from the Niagara river at Tonawanda the water had to come from Lake Erie and pass through the unimproved channel between Buffalo and Tonawanda in such quantity as to fill the enlarged prism from Tonawanda to South Greece, about seventy-three miles distant from the source of supply. To aggravate the difficulty there were factories along this stretch which depended more or less on canal water for power. While Gen. Wotherspoon appreciated the importance of manufacturing, he considered that his first duty to the State was to insure water for navigation. Accordingly he adopted a new policy; he placed the matter of maintaining the proper depth of water in this level in the hands of a single official who was answerable only to the Superintendent, and he gave strict orders that no water was to be diverted from the canal except with the knowledge and consent of the Albany office. The result was that for the first time in several years no complaints of insufficient depth were received from the boatmen.

Gen. Wotherspoon succeeded in having two important laws passed in 1915. These had been suggested by his predecessor, Superintendent Peck, just before he vacated the office. One (chapter 448)

made it a felony for any person without authority of law wilfully to inflict an injury upon any part of the canal system or to tamper in any manner with the machinery or apparatus connected with any mechanical structure. The other (chapter 491) declared it a misdemeanor for anyone without authority to remove any timber or growing things or materials from State land or to erect any building thereon. In the past the Superintendent had found himself with little authority to right certain wrongs and these statutes were intended to assist him.

The coming of the Barge canal has marked the end of the century-old custom of animal towage on the New York canals. No towing-paths even have been provided on the new waterway, except such as were used temporarily during the period of transition. In 1914 two stretches of new channel which had no towing-paths were opened to navigation. One lay in Wayne county, about twenty miles in length, and the other was a portion of the Mohawk river between Vischer Ferry and Rexford. Being thus isolated, with portions of the old canal extending from either end, it was necessary to provide some means of towing horse-drawn boats across these sections, since such craft constituted a large part of the shipping then in service. Accordingly the Legislature appropriated \$40,000 to pay for tugs to do the towing in these sections. In 1915 the Wayne county portion had been lengthened, but it was still isolated. The Mohawk river section had been extended to the Hudson river at Waterford and therefore had not the excuse of isolation in requiring State towage, but another appropriation was made that year and the practice was continued. By 1916 the Mohawk river navigation reached from the Hudson to Jacksonburg, a distance of eighty-six miles. On the Champlain and Oswego canals boatmen had adapted themselves to the new conditions and had their own facilities for towage, but on the Erie branch sixty per cent of the boats plying on the canal were horse-drawn and again the State had to furnish tugs.

Each year after 1914 and until 1921, except during 1918, when the Federal government was in full control of canal transportation, the State made provision for towing such boats as had no other means of propulsion. In effect this was the adoption of a policy, although it was done through necessity and not from free choice or with the idea that it would be permanent. This action really amounted to a canal subsidy, a thing which is acknowledged by canal advocates as unwise and also as tending to discourage the

best kind of private enterprise on the canal. But the State was confronted with the alternative of providing towage that would permit the majority of available canal craft to engage in traffic or of declining to do so, with the certainty of depriving the waterway of the larger part of its floating equipment and thus denying many shippers the advantages of canal transportation and condemning the waterway to comparative disuse. It was acknowledged of course that a sufficiency of new boats should be put on the canal and the State should not be compelled to furnish towage for the antiquated craft, but lacking this ideal only one course seemed open. The venture was not a success financially. For the first three years the towage was free and after that time the rates charged the boatmen were not sufficient to recompense the State. The cost, moreover, was large; as new sections of canal were added the amount for towage mounted higher and higher. And after all these costly endeavors to favor the owners of old boats there appears the prospect that the rate war they are planning will drive from the canal the new boats which are being operated by responsible companies and are giving such class of service as has long been the object of earnest seeking.

In 1921 the practice of State towage was discontinued. The experience of the year seemed to show that it had been maintained as long as necessary, since no marked detriment to canal traffic followed its cessation.

In 1916 at the suggestion of Superintendent of Public Works Wotherspoon a new policy was adopted with reference to the amount of security contractors should be required to furnish for the faithful and complete performance of their contracts. Originally the Barge canal law had fixed the amount as at least twenty-five per cent of the bid. By an amendment in 1909 (chapter 267) this had been reduced to ten per cent. Experience had shown that occasionally the State had lost money by this provision. It had been compelled sometimes to complete work which a defaulting contractor had failed to finish and to do this at a cost greater than the contractor's forfeited bond. The law of 1909 specified ten per cent as the minimum security and so the Superintendent appealed to the Canal Board to fix a larger sum. In response twenty per cent was set as the minimum bond for faithful performance of contracts and under certain circumstances this could be increased to fifty per cent.

The great bulk of canal construction had been completed before the United States entered the World war, but work to the value

of about six million dollars was under contract on the day when the declaration was made. Almost immediately industrial conditions began to change and it was with continually increasing difficulty that the contractors on the Barge canal were able to continue their work. It was during this first year after America's entrance into the war, it will be recalled, that such strenuous efforts were made to complete the channel throughout its entire length for an opening to commerce in the spring of 1918. To accomplish this desired end the engineers and the contractors worked most zealously and the contractors bravely did their part, although they faced the certainty of having to bear heavy financial losses. Since the contractors who had undertaken work before war was declared were not responsible for the conditions which ensued and could not well have foreseen what was to happen, it was felt quite generally that they should not be made to suffer for the benefit of the public and therefore relief measures were sought. Thus we find State Engineer Williams making an appeal to the Legislature on behalf of Barge canal contractors.

The Legislature of 1918 responded to this and other like requests and passed a law (chapter 585) which recompensed the contractors for their losses. Not only Barge canal contractors but those on other forms of public works were included in the scope of this act. We need not consider the details of the law. Its provisions were rather intricate and demanded very careful study. Our chief interest is in knowing that the State adopted this policy of relief toward the contractors carrying on its public works who were caught unawares on April 6, 1917. So far as Barge canal contracts were concerned the State Engineer found that virtually the whole responsibility for the proper administration of the law devolved upon him.

One of the provisions of the terminal law was that regulations for the management of the terminals should be prescribed by the Canal Board and enforced by the Superintendent of Public Works. Since the whole terminal project was a new venture on the part of the State, the canal officials deemed it wise to let experience dictate most of the rules. But from time to time regulations have been adopted and in his annual report for 1919 Superintendent Walsh published the seventeen terminal regulations which had been adopted up to that time.

The rules to govern general canal traffic had been published in convenient form some two years earlier. On July 1, 1917, Superintendent Wotherspoon had issued a brochure of sixty-two pages

comprising a complete set of rules and regulations for the control of navigation on the canals. It had been many years since anything like this had been published. A section of the general Canal Law directs the Superintendent of Public Works to make the rules to govern commerce on the canals, and as necessity has required, the various regulations have been adopted. With the advent of the improved canal new rules were formulated and in this year, since the whole Barge canal was about to be opened, the publication of the regulations then in force, both old and new, was very timely.

Since the Barge canal has been in operation there have been attempts on the part of Federal authorities to pass Congressional legislation inimical, in the eyes of New Yorkers, to our canals, and also a tendency to assert national jurisdiction over matters relating to navigation on the State canal system. It is interesting to observe how Superintendent of Public Works Walsh discovered and then thwarted one of these attempts. It was a proposed amendment to the Federal Act to Regulate Commerce which would have extended the control and jurisdiction of the Interstate Commerce Commission over carriers on the inland waterways, including the New York canals. Apprehensive of some such danger, Mr. Walsh had followed the progress in Congress of legislation relative to transportation and when this measure appeared he marshaled the industrial forces of the State—the commercial organizations, the merchants and the manufacturers—and led a vigorous attack in opposition. He appeared before the Committee on Foreign and Domestic Commerce at Washington on September 16, 1919, and presented a strong argument against the proposed amendment, saying that its passage would make railroad influence dominant over the canals and this would mean that the waterways would virtually lose their value. With the coöperation of the State representatives in Congress and the support of shipping interests the measure was defeated.

The attempts to assert national jurisdiction over State canal matters were apparent in 1919 and 1920. What was actually done was not so important, but it involved a far-reaching principle. United States officials were trying to enforce a requirement that steam or motor vessels engaged in carrying passengers or freight on the inland waterways of the state should be inspected and licensed by the Department of Commerce and should not be allowed to operate unless they were in charge of persons duly licensed by United States inspectors. These orders were issued in the name of the Secretary of Commerce, who evidently relied for his authority on

certain provisions of the United States Revised statutes which have to do with the construction, equipment, inspection and licensing of vessels using the navigable waters of the United States. It was held by Federal authorities that the State canals came within this classification. Under this interpretation the only State waterways left under State control would be small inland lakes which have no connection with the canals. So far as rules to govern navigation were concerned the State had its own Navigation Law, which was substantially the same as that of the National government and provided for inspecting vessels and regulating their management, operation and equipment for the safety of traffic.

In speaking of this action by the Government, Superintendent Walsh said it was directly opposed to the theory of canal construction and also to the basic law of the State in regard to its canals. Whether State or Federal regulations were enforced was immaterial—they were almost identical—but the underlying principle of control was all-important. If the authority of the National government to regulate navigation were admitted or acquiesced in by the State, then the right of the State to control its own waterway was lost and the several State canals became merely “navigable waters of the United States.” Carried to its logical conclusion the principle would require that many acts of the Superintendent of Public Works should be subject to approval by Federal authorities, the right of Government engineers to pass upon State plans for construction and repairs could not be denied, direction for the management of canal structures forthcoming from Washington would be in order and in the end the State would be left with only the privilege of paying the bills. Mr. Walsh maintained that this conclusion was not far-fetched and he urged that every means at the command of the State and its representatives in Congress should be exerted to amend the United States statutes upon which the Secretary of Commerce relied in his entrance into the field of canal control, so as to except the State waterways from their provisions.

In 1919 State Engineer Williams reorganized his department so that it might continue on the basis of maintenance rather than that of construction, such as had been the practice for many years. As construction had advanced toward completion the force of engineers had gradually been reduced and now this which was in the nature of a permanent organization was being effected.

With the virtual completion of the terminal project what Superintendent of Public Works Walsh had to say in his 1920 report in

regard to operation, charges, revenue and other like terminal subjects is a matter of interest. In organizing his forces for terminal operation he had assigned to the care of the elaborate freight-handling machinery such employees from other branches of the department as had demonstrated their fitness. With these men as a nucleus, electricians and other skilled mechanics were added. The method of management was somewhat similar to that followed at other New York city terminals. Under its workings one or more officials, called harbormasters, remain constantly on duty during sixteen hours each day at each terminal. These men are vested with authority to enforce the adopted rules, they are responsible for State property, and it is their duty to serve the needs of traffic and protect the rights of all concerned. There is a chief harbormaster to whom all questions arising between the local harbormasters and the shipping public must be referred for decision. The chief harbormaster is guided by instructions from the Superintendent of Public Works. This plan applies particularly to New York city, but for other places also harbormasters have been appointed. This form of organization has proved to work well.

Navigation on the State canals, under constitutional provision, is free, but it has been held by canal officials that this provision does not prohibit a charge for the use of terminal facilities. It has been assumed that the authority given under the terminal act to prescribe rules and regulations carries the right to impose reasonable fees. At least such has been the policy established. Upon the Superintendent's recommendation the Canal Board adopted a partial schedule of charges for New York city and Buffalo terminals. Temporarily the imposition of fees at other terminals is held in abeyance, although it has been made plain that such policy is not to be permanent. The arrangements so far have seemed to be satisfactory to everybody and the fees have been paid willingly. Care has been taken not to make the charges too great, lest traffic be discouraged, but it is considered only just that the canal terminals shall become self-supporting.

The revenues from the New York city terminals had become sufficient in 1920 to assure their position not only as self-supporting institutions but also as producers of a surplus for making future improvements.

For the better management of the terminals Superintendent Walsh suggested a few amendments to the law. As the law stood the Canal Board was the governing body and the Superintendent was limited in his acts to directions given by the Board. In the opinion

of Superintendent Walsh, while this provision was wise in its application to broad matters of policy, it restricted the Superintendent so narrowly that he could not cope with exigencies as they arose or administer the terminals to the best interests of the State. Mr. Walsh recommended an amendment to correct this situation. He also recommended an amendment to allow the Superintendent to impose penalties for the violation of rules. It was necessary too that the Superintendent should have authority to remove from a terminal any vessel, sunken or afloat, which should become a hindrance to the proper use of the terminal or a menace to other craft. As a fourth recommendation he suggested that a similar provision should authorize the disposal of freight which the owner should refuse or neglect to remove or which might be unclaimed or abandoned.

In 1921 Superintendent Cadle remitted wharfage fees on boats lying at terminals and loading or unloading. He considered that every effort should be made to foster use of the canals and this was one means he employed to accomplish the desired end.

As a final policy there remains to be considered, not a policy adopted by some canal official in connection with construction or management, but a policy advocated by representatives from commercial and civic bodies throughout the state. The questions involved in this policy had been receiving much attention for some time and many conferences were held, not only to formulate a definite policy, but also to determine the nature and location of further canal improvements. The subject was thoroughly discussed at public meetings and it was decided to submit to the Legislature a proposition calling for a further issue of bonds. The slogan "Finish the job" was adopted and after a meeting held in Albany in March, 1920, a program of action was adopted which resulted in the introduction in the Senate of a bill to authorize a bond issue for a sum not to exceed \$33,000,000. The particular improvements specified in the bill included grain elevators, coal transfer terminals, Hudson river terminals, the completion of certain canal terminals and new canal terminals. The locations and the sums for the grain elevators were: Buffalo, \$1,600,000; Tonawanda, \$1,000,000; Oswego, \$1,000,000; Gowanus bay, New York, \$2,400,000. There was to be coal transfer construction at two terminals, Ithaca and Watkins, to cost \$1,250,000 at each place. Terminals were to be built at five Hudson river cities, these being Poughkeepsie, to cost \$400,000; Kingston, estimated at \$700,000; Newburgh at \$600,000; Hudson at \$300,000; and Yonkers at \$500,000.

For completing terminal construction there were to be the following sums: At Erie and Ohio basins, Buffalo, \$2,500,000; at Rochester, \$1,400,000; at Syracuse, \$650,000; at Utica, \$450,000; and at New York city, \$3,500,000. A million dollars was added for terminals at municipalities not specifically mentioned and for coal- and freight-handling devices at all terminals. These items totaled \$20,500,000. The remainder, \$12,500,000, was intended to cover obligations said already to have been incurred by the State in connection with damage claims arising from canal and terminal work performed.

Although the bill failed of passage, appropriations have since been made for some of the projects. The Gowanus elevator has been built and that at Oswego started. Sums have also been provided for continuing terminal work at New York city, Buffalo and Rochester. The State had previously made a beginning of the Hudson River terminals. All of these several projects gathered together in a single measure had the appearance of a large, new policy, but really it was only the assembling of what had been discussed and advocated separately and in part had already been adopted or soon thereafter was to be adopted as a State policy.

CHAPTER XII

OTHER DETAILS AND INCIDENTS

Pollution of Canal Waters—Attempt to Secure Crescent Power—Canal Lands for Municipal Parks—Tree-Planting on Canal Lands—Canal Lands for Industrial Use—Proposed Wider Channel, Waterford to Oswego—Bridge Dam Made Highway Bridge—Old Canal Filled at Fulton—War Time Military Protection—Schenectady-Scotia Bridge—Rexford-Aqueduct Bridge—Bridges at Phoenix, Fulton and Minetto—Elements of Efficient Canal Management—Zones of Canal Influence—Canal Visitors.

DURING the years of constructing the Barge canal there has been a multitude of interesting incidents which have been neither matters of policy nor yet affairs very intimately connected with the actual building but which have been more or less closely associated with the canal and are important enough to deserve a few brief words of notice. Of the many incidents only a few can now be reviewed. Of necessity these have but little connection one with another.

The first in order of time of those to be considered is the attempt to rid canal waters of pollution. In his report of 1907 Superintendent of Public Works Stevens discussed this subject at some length. What he said pertained largely to the old canal but a glance at his statements enables us to know what harmful practices had prevailed on the old waterway—practices which in some measure were being carried over to the new canal. For years the citizens of the cities and villages through which the canal passed had come to look upon the waterway as the legitimate place for emptying sewers or for receiving whatever noisome or waste materials they desired to be rid of. As a result, during the summer the waters were foul and in winter, when the canal was empty, it resembled a public dumping ground and an open sewer. The State could not well maintain a force for policing the whole length of the canals, and municipal authorities, both police and health officers, seemed to have fallen into the way of entirely overlooking violations of the penal code if the offenses were against the canal. The waterways accordingly had become displeasing to the senses and a menace to health. Inherently the canals were capable of being attractive. Some of the purest water in the state, from mountain streams

or woodland brooks, was used to feed them. The disrespect thus engendered for the physical appearance of the canal could but be reflected in a feeling that the waterway was of little real use. How wide-spread was this opinion we have already seen, and the communities which were the chief beneficiaries from canal traffic were largely responsible for this conception, since they by their failure to enforce the law had fostered the evil practices. Mr. Stevens had instituted a reform and was trying to instill a wholesome respect for the canals by making them less offensive to sight and less detrimental to health.

Since the Barge canal lies largely in natural streams the conditions attending the pollution of its waters differ from those of the old canal. The tendency to use it as a dumping ground is not so great but the practice of making it a receptacle for sewers and industrial wastes still goes on. The desire to exclude pollution from our canals has now been reinforced by the incentive to keep clean our principal natural streams. Moreover the old custom of draining all sewage, without chemical or other treatment, into streams is gradually giving away to the modern idea of scientific disposal plants. But this change, if left to municipalities alone, is slow and so we find State officials endeavoring to hasten the time when our streams will be purified.

In each of his four annual reports State Engineer Bensel recommended legislative action to provide remedies for existing conditions. Early in his administration he had consulted with Governor Dix and the State Health Department on the subject of sewage disposal plants for municipalities along the canals. The existing statutes were inadequate to correct improper conditions. Prior to 1903 the State Department of Health had no power whatever to enjoin or remove sewage pollution from any State waters. In 1903 an act was passed which provided a remedy against future pollution but which, unfortunately for the cause of stream purification, specifically exempted municipalities and industrial plants that were discharging sewage and waste into State waters at the time of the enactment. An act of 1910 invested the Health Department with further powers but failed in effective purpose because under its limitations it was necessary, after full investigation and report, to establish the fact that the pollution was a public nuisance or a menace to health. Mr. Bensel's recommendations were unavailing. A change so radical would involve large expense for the municipalities and accordingly opposition was too strong to permit

the passage of measures adequate completely to eradicate the stream pollution evil.

An incident of late 1909 and early 1910 is interesting, especially in the light of the recently-adopted State policy for the development of Barge canal water-powers. In November, 1909, the Cohoes Company, the power company which since 1826 has developed power from Mohawk river waters in the vicinity of Cohoes falls, petitioned the Canal Board, requesting the conveyance of certain lands, then a part of the old Erie canal, without compensation to the State therefor, and also the use of certain waters impounded by the new Crescent dam, as partial compensation to the company for damages alleged to have been caused by the construction of the Barge canal. Also a bill was introduced in the 1910 Legislature to authorize this company to use the waters impounded by Crescent dam.

The State canal officials were bitterly opposed to the proposed legislation. They considered it contrary to the broad policy the State, in their opinion, should adopt, namely, that of disposing of Barge canal water-powers under a general law, covering all cases, which should be to the benefit of all the people of the state rather than to a few individuals or corporations. Moreover, as was shown by the expert electrical engineer of the State Engineer's department, the company proposed to pay to the State annually from \$3,000 to \$7,500 for power which he estimated it could sell at a net profit of \$65,000. The opposition of the officials prevented the passage of the bill. One thing State Engineer Williams did to bring about this result was to print the documents pertaining to the affair in the *Barge Canal Bulletin* and send this publication broadcast over the state.

We should notice also a few recommendations the State Engineer made from time to time for employing Barge canal lands for useful public or industrial purposes. In 1909 State Engineer Williams suggested the advisability of using certain elevated areas that had been created by depositing material from Barge canal excavation. Where these areas were near cities and villages they could be converted into municipal parks and such use would greatly benefit the people of the localities and would not be detrimental to the canal.

Another suggestion Mr. Williams made was to plant trees on spoil-banks that were unsuited to cultivation. When he first recommended this, in 1910, he had in mind particularly the sandy stretch to the east of Oneida lake, where such trees, in addition to utilizing

waste lands and lending beauty to the landscape, would serve the very useful purpose of stabilizing the shifting sands. In suggesting this action later, in 1918, Mr. Williams advised the use of a much wider range of canal lands for tree-planting. A few pieces of land covered with material deposited from excavation had been reconveyed to former owners, but in the majority of cases it seemed wise for the State to retain possession, since the areas might be needed again, if in the course of maintenance more material should be taken from the channel. Moreover these lands were often in small parcels of irregular shape and covered as they were with three or four feet of newly-excavated material were of little value to private owners, especially for agricultural use. Originally many of these areas were rich bottom-lands that would be excellent for trees, once their roots had struck through the new material.

Another and a very important prospective use for canal lands was that of serving as sites for industrial plants. This suggestion came from State Engineer Bensel. In the course of construction low and waste areas had been filled and also arable lands had been made non-productive, and all together there were available numerous desirable sites for manufacturing and business plants. These were situated near the canal of course, where they would be in direct touch with water transportation, and generally rail connections also could be easily provided. And besides these advantages, factories on such sites, as State Engineer Williams pointed out in his subsequent advocacy of this project, would be in position to avail themselves of canal water-power, when such power should be developed. These suggestions have been followed in some measure. For example three large oil companies have located near the Syracuse terminal.

State Engineer Bensel made a recommendation to widen certain portions of the canal, which however was never carried into effect. He judged that a part of the traffic from the Welland canal would desire to utilize the Barge canal between Oswego and New York city, thus reaching the Atlantic coast by a shorter route than that through the St. Lawrence river. Barge canal locks would accommodate the boats which navigated the Welland canal, but there were approximately fifty miles of canal between Oswego and Waterford which had a bottom width of only 75 feet, not enough to allow two boats of maximum lock capacity to pass one another. Mr. Bensel called the attention of the Legislature of 1913 to this condition and recommended that it consider the question of making an additional appropriation for the purpose of increasing these narrow

portions of canal to a bottom width of 110 feet. The estimated cost of such widening was \$2,000,000.

The movable dams of bridge type have already been mentioned several times. Although the bridges were built primarily to function only as parts of the dams, they were inherently capable of serving also as highway bridges. There are eight of these movable dams in the lower Mohawk and some of them are situated where highway bridges across the river would be most acceptable to the inhabitants. At one dam, that at Rotterdam, the bridge has been converted into a highway structure. This work was done under an act (chapter 714, Laws of 1913) for the specific purpose, a special appropriation being made. In this instance the State bore the expense. Whether the State or the municipalities benefited or both together will pay for changes to others of these bridges, if they should be converted into highway structures, is a question still to be settled.

A work of considerable importance to Fulton, on the Oswego canal, was that of filling the channel of the abandoned canal within the city. This work was done under special authority of chapter 530 of the laws of 1914, which however directed that the money for it should be taken from the Barge canal fund.

A feature of our war-time experiences was the stationing of military guards at all strategic points on the Barge canal — places where by using explosives the waterway could be so damaged as to cause long interruptions in navigation as well as large financial loss. At all of the locks, dams and other important structures these details of soldiers were encamped. Visitors were not permitted at these structures and only persons who had passes duly signed by the proper officials and who had actual business to transact were allowed upon them. The canal officials took pains to make the soldiers as comfortable as possible during their rather long stay, especially at the outlying posts.

There are a few bridges over the Barge canal which for one reason or another can be regarded as only partially belonging to the canal enterprise. The largest and the most elaborate of all bridges spanning the new waterway — the one which joins Schenectady and Scotia — is of this class. Before the State got around to rebuilding the near-by old bridge the residents of Schenectady conceived the idea of putting the new structure a half mile farther west, so that the approach to the city would better suit their plans, and substituting for the somewhat modest but, to the minds of canal officials, entirely adequate bridge an imposing structure made up

of numerous concrete arches. When the subject was broached to State Engineer Williams he strongly opposed the plan. The cost would be many times that of a bridge sufficient to meet all canal needs. But the people of Schenectady and vicinity began to agitate the project. They advertised the structure as an essential part of the main east and west highway across the state, christening it the Great Western Gateway. They enlisted the support of the whole Mohawk valley and even the region beyond, and came down to Albany in such force that the Legislature was constrained to grant their request. First the State Engineer was directed to make plans and estimates. This was in 1917. Then in 1919 construction was authorized in accordance with these plans. The bridge is of concrete arch construction, having twenty-three arches. These range in span from 106 to 212 feet. The whole structure, including approaches, is about three-quarters of a mile long. The money for construction comes from three sources—special legislative appropriations, funds supplied by the city and county of Schenectady and the village of Scotia and a sum set aside from Barge canal moneys. The bridge is now nearing completion.

Another bridge, built because of Barge canal construction but not a part of it, is the one across the Mohawk river joining the village of Rexford and the hamlet of Aqueduct. Here the old canal used to cross the river on what was known as Rexford Flats aqueduct. The new structure utilizes parts of the old aqueduct, but a steel span crosses the new canal channel. Chapter 176 of the laws of 1921 authorized the work and provided the funds.

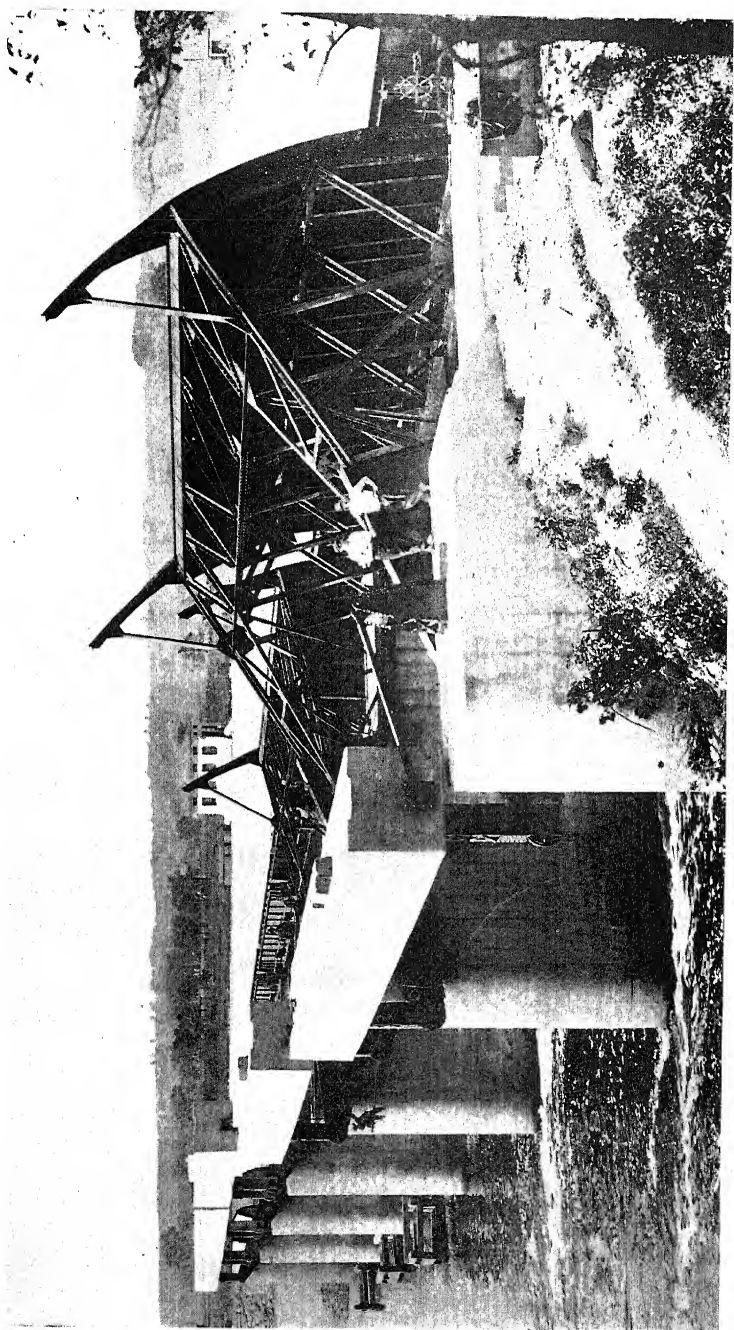
Three long new bridges over the Oswego river, built during the course of canal construction, were paid for only in part by the State. These bridges, at Phoenix, Fulton and Minetto, are all concrete arch structures. The State in each instance bore the expense of only the span across the canal, the remainder having been paid for by the towns connected by each bridge. At Fulton the canal span is an arch, like the rest of the bridge, but at Phoenix and Minetto the State spans are, respectively, a bascule and a convertible, the latter being capable of conversion into a bascule.

In the 1920 annual report of Superintendent of Public Works Walsh, presented to the Legislature just as he was retiring from office, we find a discussion worth noticing. He was giving his views with reference to the necessary elements of efficient canal management. In considering what he had to say it must be remembered that as a practical canal transportation operator of many years standing he had become keenly aware of certain defects in the

management of the State waterways and then as head of the department he had viewed the subject from a new angle and had learned the difficulties in the way of securing better operation

Mr. Walsh began his discussion by commending the progress made in the preceding double decade. Prior to that time it had been the generally accepted doctrine that the canal system was a legitimate field for political manipulation, and as a result nearly the whole roster of employees had been changed with each change of administration. But even before the new canal had come into use a better condition had begun, and later, when the elaborate machinery of the new type of structure demanded skilled operators, a large part of the working force was selected by competitive civil service examinations and men of a much higher grade were obtained. Such action had met with general approbation and it was for the continuation and extension of this practice that Mr. Walsh was asking—the putting of canal operation and management on a business basis, entirely divorced from the domain of politics. Party lines had been obliterated in the agitation for canal improvement, said Mr. Walsh, and now that the new waterway had become an essential factor in commerce, strict business principles should be applied to its administration, some degree of permanency should be assured in the service and every employee should be made to feel that his term of employment depended solely on his attention to duty and his fitness for the work. But it might be, in Mr. Walsh's opinion, that the root of the trouble lay in the impermanency of the position of Superintendent, which in its legal status was no more definite than that of a humble bridge tender. His tenure of office was solely at the Governor's pleasure. The provisions governing the office harked back to the time when the canals were regarded as the battlefield of politics, when campaigns were won and lost on the success or failure of the canal administration. But those days had passed. The State's waterways were gradually but surely coming to be recognized as a purely business institution, demanding the eradication of all elements except those tending to commercial success.

Aside from the all-important matter of transportation, other vast interests were intrusted to the Superintendent of Public Works; millions of the State's moneys were dispensed by him annually; questions of enormous importance were presented to him for decision almost daily. The efficient conduct of the affairs of the department demanded the services of a broad-minded executive of wide experience and also a continuance in office for a specific term



Taintor gate section of a dam in the Hudson river, near southern end of the Champlain canal. Each of the six gates has a clear width of 50 feet. Top of gate, when lowered, is 17 feet above the sill. Remainder of dam is a fixed structure. At its farther end is located a lock.

of reasonable duration. Since gubernatorial elections take place biennially, the Superintendent's term might be limited to two years. This had often happened and occasionally the time had been less than two years. Whenever a change should occur in the office of chief executive of the State, whether in the same political party or another or even, it might be, in the midst of a term, the Superintendent must be prepared to vacate his place in favor of the new Governor's appointee. If a Superintendent's services were limited to two years, only a small portion of that time could be devoted to the execution of policies which in his judgment seemed best for the State. More than half of the first year would have elapsed before he could acquaint himself with the vast property under his charge, the important interests he must guard and the facts as to the actual working out of the policies of his predecessor. After his own plans had been formulated, the effecting of any important changes must of necessity be gradual and slow and the result was that the navigation season of the second year would be well under way before the newly-adopted policies should be even in operation.

This situation, to Mr. Walsh's mind, was impossible. His remedy was the fixing of a definite term of office, at least five years, with the incumbent, like other State officers, subject to removal before the end of his term only upon stated charges and after a public hearing. Moreover, as far as possible the office should be removed from politics. To accomplish this latter result Mr. Walsh recommended an innovation in State affairs—nothing less than legislation which in effect would vest the nomination for Superintendent of Public Works in the recognized business agencies of the state. While this principle as a State policy might be considered as without precedent, really it had already been applied, not only in the case of the canal itself but in other State matters as well.

During the course of canal construction one particular study was made which deserves brief notice. It is a study which throws much light on the potential influence of the canal on the transportation problems of the whole state. The object of the study was to learn what proportions of the state's population were in either close or remote touch with the canal. The various branches of the canal system penetrate to many parts of the state and in the study under discussion this system was considered as consisting of all the State waterways of Barge canal dimensions. Although Lakes Erie and Ontario and the St. Lawrence river might with propriety have been regarded as parts of the waterway system, they were not so considered in this particular study. If these bodies of water

had been included, the showing in favor of the canal would of course have been still better. From the study it appears that 73½ per cent of the population of the whole state is within two miles of the waterway system. In like manner it is seen that 77 per cent of the population is within five miles, 82 per cent within ten miles and 87 per cent within twenty miles. Looking at the facts from a different angle it appears that 46 per cent of the total area of the state is within the twenty-mile limit. Considering two other distances from the waterways, fifty and seventy miles, the possibilities of a combined canal and automobile traffic become apparent. These are the respective distances which motor trucks of 3½ and 2 tons capacity can cover in a day's run, going and returning. The territory within fifty miles is 71 per cent of the area of the whole state, while that within seventy miles is 88 per cent of this total area. A productive field for motor truck operation in connection with the enlarged canals was thus revealed. Since New York's population is approximately one-tenth that of the whole country, we see that about seven per cent of the people of the United States are within a half hour's walk of the New York waterway system. Translated into numbers this percentage represents about seven million individuals. It is apparent then what it means to the State and also to the country at large that the products of these seven million people and the supplies they need may have available the means of cheap water transportation, especially after the traffic shall have been developed to the full extent of which the new canals are capable.

Another interesting feature connected with the Barge canal is the visitors it has attracted. The new waterway has been the Mecca of many pilgrimages. Of course it is not possible, even if it were desirable, to enumerate all of these, since no record has been kept of the great majority of them, but a few notable examples may be mentioned. Probably the largest single company to visit the canal was composed of delegates to the International Navigation Congress. This Congress convened in Philadelphia, Pa., in May, 1912. Delegates from all over the world were in attendance, some forty countries being represented. After the convention many of the visitors joined an excursion which had as one of its principal objectives the inspection of the Barge canal throughout its entire length across the state. This party traveled by special train and was large enough to require twelve cars for its accommodation. Two days, June 7 and 8, were spent in the trip from Albany to Buffalo, several rather long stops being made on the way to allow

close inspection of canal structures. Thus the party had a chance to walk over the land line at Waterford, to visit the movable dam at Fort Plain and the lock of 40½ feet lift at Little Falls, to go over the interesting work of canal construction and railroad relocation at Rome or to take automobile and visit the Delta dam, and to get a close view of the tandem locks and other structures at Lockport. Other parts of the canal, of course, could be seen from the car windows throughout most of the trip. Dr. Elmer L. Corthell, member of the Advisory Board of Consulting Engineers during the early stages of Barge canal construction, was much interested in the affairs of the Navigation Congress and he was largely responsible for arranging the excursion over the canal. Many of the delegates were engineers and were especially interested in so remarkable an engineering project as the new canal. Four or five engineers from the State Engineer's department accompanied the party.

Later in the same year another party, composed largely of foreigners and traveling by special train, visited the Barge canal, but in this case the inspection of the canal was but one of several interests. The trip made by this company was known as "The Transcontinental Excursion of 1912 of the American Geographical Society of New York," and was in celebration of the sixtieth anniversary of the Society and of the completion and occupancy of its new building, situated at Broadway and 156th street. The excursion started from New York on August 22 and after traversing the continent along a northern route returned by a southern route and reached New York on October 17, disbanding after a closing dinner at the Waldorf the next evening. Some of Europe's most distinguished scientists and scholars were in the company and everywhere along the route they were welcomed by citizens and organizations and heralded by the press in such manner as became their high standing. The party consisted of forty-three foreign members, from thirteen countries of Europe, and about a dozen permanent American members, but the director of the excursion, Professor William M. Davis of Harvard University, had arranged for many temporary members to be with the party for one, two or three days at a time in regions where they could serve as guides and helpers by reason of their own studies or their familiarity with certain local conditions. Increased by these temporary members the American contingent numbered ninety. Among the temporary members was a representative from the State Engineer's department, who was with the party from Albany to Buffalo on August

22 to 24 and also at the closing dinner at New York. At the request of the director of the excursion this representative was designated by the State Engineer and it was his task to impart to the visitors information concerning the Barge canal. It fell to the lot of the writer to be this canal representative and he observed that the members of the party, especially the foreign members, showed much interest in the new waterway, more in fact than was manifested by the engineers who earlier in the year had visited the canal with the excursion of the Navigation Congress.

In the summer of 1913 an inspection of the canal was made under the auspices of the Buffalo Chamber of Commerce. This trip extended from Buffalo to Albany and consumed three days. It was conducted personally by State Engineer Bensel and his Deputy and Division Engineers, he having attended to making arrangements for the excursion after the men from Buffalo had expressed a desire to take such a trip. The Buffalo Chamber of Commerce was the first commercial organization in the state to undertake anything of this kind. Its purpose was to afford its members opportunity to acquire first-hand information in regard to the canal and the progress of its building. The utter lack of knowledge concerning the canal on the part of chambers of commerce, boards of trade, cities, villages and the people in general throughout the entire state, and even a well-defined apathy in many places were appalling to those members of the Buffalo organization who had the welfare of the canal at heart. They determined, therefore, to make such a condition impossible in their own body and at the same time to set an example for other organizations.

The engineers who have visited the canal singly or in small groups are numerous. They have come from all parts of the world, often being sent by their governments to make a careful study of the whole waterway or some special type of construction. Some of these engineers have been about to design canals for other localities. Of this class was a company of men who had in charge the Lake Erie and Ohio River canal, a project to join the Ohio river at Pittsburgh with Lake Erie. In this instance members of the Ohio and Pennsylvania commission, as well as the engineers, visited the Barge canal. So too the Federal engineers who were to design the prospective Lake Erie and Lake Michigan canal, joining the heads of Lakes Erie and Michigan, and certain of the intracoastal canals along the Atlantic shore, as well as other national projects, have been interested visitors to the New York waterway. These engineers have always been shown every possible courtesy

and sometimes the State Engineer has assigned a member of his corps to accompany them on their trips.

The delegates to one of the annual meetings of the Atlantic Deeper Waterways Association, convening in New York city, were taken on excursion up the Hudson, in order that they might appreciate the importance of the Deeper Hudson project, and then the trip was continued to include the spectacular land line section of the Barge canal between the Hudson and Mohawk rivers in the vicinity of Waterford.

The visit of chief importance perhaps, as far as its influence is concerned, was that of the fall of 1921, when a company composed of about forty members of Congress, representing the western, southern and southwestern states, and manufacturers and business men of the Great Lakes territory, together with a goodly number of New Yorkers, were taken in boats up the Hudson and through the new canal under the auspices of certain chambers of commerce and public spirited men of the state. Inciting this excursion was a desire to combat what New Yorkers consider is the pernicious agitation for the St. Lawrence ship canal. The attempt appeared to be successful. The members of Congress acknowledged that their former ideas of the inadequacy of the Barge canal were entirely erroneous and expressed their determination to oppose the St. Lawrence scheme. Several members of the Public Works department accompanied this excursion.

CHAPTER XIII

THE COMMISSION ON OPERATION

Commission Created—Its Duties—Its Personnel—Its Work—Its Recommendations—Review of Recommendations: Traffic Organization: Co-operative Rail and Water Relationships Charting Canal Waters: Distribution of Canal Cargoes by Surface Railways—Mr. Bense's Dissent—Its Details

THERE is a paragraph in the report of the Committee on Canals, the body that definitely formulated the Barge canal policy, which we did not notice in passing but which is pertinent to the subject now in hand. "As stated in the beginning of this report," says the committee, "in our judgment the efficiency of the canals depends quite as much upon the way the business is handled on them as upon their physical size, and we advise against the expenditure of any more money for their enlargement unless it shall be accompanied with measures which will lead to the adoption of more modern methods in conducting the business of water transportation across the state. The policy of the State hitherto has been to discourage the adoption of modern business methods and to foster the handling of the traffic by canal boatmen owning each a single boat, or small companies owning a few boats. This prevents the State from taking advantage of those improvements in business management which have brought about such enormous economies in other lines. Canal legislation has been largely in the interest of the comparatively small number of canal boatmen, but it has resulted in failure so far as they are concerned, for experience has shown that they are unable to cope with the methods employed through corporate action"

Some of the recommendations made by the Committee on Canals for adopting modern methods in conducting the business of water transportation were carried into effect. Aside from the repeal of the statute limiting transportation companies to a capital of fifty thousand dollars, these changes, however, had to do largely with the period of canal construction. The recommendations of the Terminal Commission in their turn resulted in the State again advancing by seven-league strides, but neither of these commissions had much more than hinted at the subject of canal administration

and management. As the time for opening considerable portions of the new canal approached this became a live topic and a commission for its special consideration was created. The immediate cause back of the creation of this commission was a recommendation by Superintendent of Public Works Treman in his annual report to the Legislature of 1912.

The specific objects of investigation assigned by law to this commission, as paraphrased in its report, were the following: Rules and regulations for operating the Barge canal; methods to be applied in the matter of maintenance; principles to be applied to the end that commerce upon the canals may be encouraged, fostered and protected; the type or style of craft best suited to navigation; rules and regulations governing the operation of canal terminals; statutory changes necessary or desirable to a proper, efficient and economical management of the enlarged canal; also any and all other subjects and matters, the study of which may be expected to contribute to a wise and efficient administration of the State's waterways system, to the end that the new and enlarged waterways may fulfill to the greatest measure possible the purposes had in mind when their construction was authorized.

The creating act, which became a law February 28, 1912, (chapter 9) called this body a Commission on Barge Canal Operation and designated as members the two who then held the offices of State Engineer and Superintendent of Public Works and three others, to be appointed by the Governor from among persons who had had executive experience in the administration of the New York State canals. After the three appointees were named by the Governor the personnel of the commission was John A. BenseL, State Engineer, Duncan W. Peck, Superintendent of Public Works, Charles E. Treman, John N. Partridge and Winslow M. Mead. Mr. Treman and Mr. Partridge had each filled the office of Superintendent of Public Works, Mr. Treman in 1911 and 1912 and Mr. Partridge from 1899 to 1901, and Mr. Mead had but recently retired from the office of Deputy Superintendent of Public Works, which he had held since 1901. At the first meeting of the commission Mr. Treman was chosen chairman and Mr. Mead secretary.

One of the first acts of the commission was the sending out of nearly a thousand circular letters to boatmen, forwarders, marine insurance officials, shippers, boat-builders and other persons or organizations which were supposed to have the interests of the canal at heart, asking the recipients to submit whatever helpful sug-

gestions they could. A little later public hearings were conducted, one in Buffalo and one in New York. The commissioners also made a personal inspection of some of the Canadian canals and to add to all the information they could collect relative to the management of American canals the secretary of the commission visited Europe and there made a study of the operation and control of canals, harbors, terminals and canalized rivers.

Probably the greatest contribution of this commission is to be found in its recommendations concerning two essential improvements, one the establishment of a traffic organization and the other the adjustment of relationships between rail and water carriers which should not be inimical to the canal.

First we shall quote a summary of recommendations submitted by the commission in its report to the Legislature and then we shall examine in detail the studies which led to some of its conclusions. This summary, which includes the more important recommendations, is as follows.

"That the Superintendent of Public Works be continued in charge of the canals, and that the division superintendents be increased from three to four in number, section superintendents being eliminated.

"That a traffic organization for the canals be established, to the end that traffic may be diverted to the canal route and the State's commerce maintained and extended

"To the end that interchange of traffic between railways and canals may be effected, that the Public Service Commission be given authority to compel extension of railway tracks to all canal terminals on such terms as may appear to be equitable.

"That such amendment of the statute shall be had as shall be necessary to prevent further disposition of any of the State's holdings of land under water or of water frontage excepting upon revocable leases, and that no lease should be for a greater term than twenty years.

"That the Public Service Commission be given authority to establish rates on through route and joint rates by railway and water carriers; and to prescribe a fair division of such rates; to prevent railway companies exacting from shippers more than they charge for same service if goods were shipped by rail under joint traffic agreement by connecting railroads; power to compel the issue of through bills of lading; authority to compel railways to charge less than local rates to all lake, river and sea ports on

through traffic to be exchanged with boat lines engaged in the domestic trade unless prorating arrangements already exist; authority vested in the Public Service Commission to compel fair treatment of canal-borne traffic by railways, and, further, to determine elevator and service warehouse rates, and maximum tug or other tractive power rates.

"All water lines operating within the State, whether controlled by corporation, company, firm or individual shall by statute be declared to be common carriers.

"That terminals and terminal equipment be operated as a separate bureau under the direction of the Superintendent of Public Works, and all accounts kept separate from maintenance and operation of the canals proper.

"Creation of a chief harbor-master, with local harbor-masters in charge at each terminal.

"That the Superintendent of Public Works be authorized to levy terminal charges against commodity tonnage, subject to the approval of the Canal Board, the rates being only sufficient to cover cost of upkeep and operation of terminals, the revenue therefrom to constitute a sinking fund to be devoted to repair and extension of terminal equipment.

"That the Public Service Commission be given power necessary to enable authorization of the use of surface lines for goods delivery purposes in terminal cities.

"That separate quarters in terminal storehouses, special berth, piers, cranes, and other utilities be assigned at terminals for the accommodation of package freight.

"That the Superintendent of Public Works, the State Engineer and Surveyor, and the Canal Board be given authority to grant owners of land adjoining canal waters authority to construct graving-docks, under proper restrictions.

"The enactment of a statute prescribing stringent rules for the transportation of explosives through the canal, and forbidding the mooring of boats carrying explosives, petroleum or any of its by-products, in basins or at any point excepting such place as may be specially prescribed by the Superintendent of Public Works.

"That steps be taken for charting and lighting of the river and lake portions of the canal uniform with federal regulations governing such matters.

"That provision be made for the installation of a complete telephone system, on the canals.

"Appropriations for the procurement of new repair machinery and hydraulic dredges.

"The repeal or amendment of several minor statutes in the interest of consistency, and to the end that an adjustment to new conditions may be made certain.

"That a more comprehensive method for disposing of abandoned canal lands may be made, to apply to the lands that will be abandoned as a result of the placing of the improved canal in commission.

"Modification of civil service laws affecting skilled operatives in the Department of Public Works.

"Amendment of statute so as to increase maximum speed of craft in river and lake sections.

"Maximum dimensions of craft to be left to Superintendent of Public Works to determine."

Among a few minor recommendations may be mentioned three — one that the Superintendent of Public Works should have full authority in matters of sanitation on the canals, another that he in coöperation with the Canal Board should have such jurisdiction over private docks and terminal equipment as to prevent them from being a menace to State terminals, and the third that the law be amended so as to allow greater speed on the canals than the four or six miles then permitted on various sections.

It will be observed that certain of these recommendations are but echoes of recommendations made by the Terminal Commission in its report in 1911. The first, third, fourth, fifth, sixth and ninth items of the summary just quoted are of such character. These relate to the administration of the canal being entrusted to the Superintendent of Public Works, the retention of State lands, the fixing of terminal charges and the regulation of canal and railroad relationships.

In recommending a traffic organization the commission was trying to cure one of the most pernicious ills of the whole canal system. To illustrate the gravity of the situation the report pictures what would happen if a railway should adopt the methods employed on the canal. This railway would maintain its trackage but the cars would be owned and operated by individuals. When a shipper had goods to send he would be obliged first to find an owner who had a car available for the service and then to bargain with him, since there would be no fixed rate for the use of the car. The only standard to guide in determining this rate would

be what some other individual had asked in payment for a similar service at a particular time. With such a condition, the commission points out, there would be chaos and neither the shipper, the consumer nor the car owner would be benefited; no one indeed excepting possibly a competing railway with systematized methods and highly developed regulations, offering through and combined rates to destination, would be the gainer.

"Yet this very condition, premised in the case of a railway company," to quote the report, "is the one that has been in existence on the canals since they were first placed in commission. There has been no unison of action on the part of individual boat owners; no guarantee, little assurance, no promptitude in the service, no energy in building up a clientele, no harmony of interests, no care for cargoes, no combined rates, no advance rate on which a shipper might depend as a basis for figuring on transportation; and the safety of the cargoes has been so little regarded that even the marine insurance companies have thought it necessary either to exact a greater rate than the cargo could properly stand or withhold insurance altogether. If the Barge canal is to be a success, system, capacity, reliability and stability must be substituted for the chaos that heretofore has ruled."

If objection be raised to the maintenance of a traffic bureau on the ground that such action becomes paternalism, the commission answers that the line into paternalism was crossed when canal tolls were abolished. If it be contended that the State should not enter into competition with railways which enjoy State charter and contribute a corporation tax in support of the State government, the answer is that the idea that railways and canals are competitors has been discarded abroad, is fast being discarded here and will be wholly discarded if the era of water-borne traffic on which the country seems to have entered develops to its promised proportions. The truth of the principle that the rational relationship between canals and railways is complementary rather than competitive was proved by universal experience in Europe. So thought the commission, and it believed also that the establishment of a traffic bureau, although its acknowledged aim was to divert traffic to the new canal, would neither infringe on the rights of railroads nor for long do violence to their interests.

In going still farther and trying to secure coöperative relationships by compelling physical connections and a free interchange of freight between canals and railways the commission realized that

it was dealing with a delicate question. Until the European idea of mutual benefit became more general any legislation looking toward compulsory coöperation was apt to be viewed as offensive, unjust and actually infringing on corporate rights. Nevertheless it was so important a question that without its settlement in favor of the canals their success, notwithstanding their natural advantages of cheap transportation, was a matter of grave doubt. This was a question, moreover, which had been much studied by Federal, State and municipal officials throughout the country. In the recommendations quoted we have seen in brief form how the commission proposed to solve the problem for New York State, and the solution it suggested was in close accord with Federal action for regulating interstate and foreign commerce. We shall see a little later that the commission's recommendations on this subject were enacted into State law.

In considering the regulation of the canal terminals the question arose in the minds of the commissioners whether the constitutional provision prohibiting the imposition of tolls on persons or property transported on the canals could be construed to mean that no charge might be made for the use of terminal facilities. The law authorizing the terminals mentioned certain charges, which were to be established by the Canal Board and collected by the Superintendent of Public Works, but of course this law would not hold against any constitutional dictum.

The commission argued that canal terminals as now conceived did not exist when the constitutional amendment was passed, and reached the conclusion that no fair minded person could claim that it was ever intended by any one who had to do with authorizing the terminals that their facilities, including human and machine labor, should be furnished free by the State or that any equipment except the channels themselves should be free to commerce. Moreover it was not believed that commerce was in need of any such wholesale subsidy.

There are only two other recommendations which we desire to consider in detail. One concerns the charting of river and lake channels and the other the use of surface railways for distributing canal cargoes in cities and villages. It is obvious that a waterway having a channel somewhere within the broad expanse of river or lake area rather than confined within its own fixed banks needed charting. The suggestion was that the Federal practice be adopted. Eventually, as we have already seen, the channels were buoyed and

lighted to accord with this practice and the Federal government was even persuaded to make charts, through its Great Lakes Survey organization, of the New York State canalized streams and lakes. In addition the State also has issued certain navigation charts.

The suggestion to use local railways to distribute goods was excellent. It was in line with a use of such trackage already being made in many American cities and in suburban territory to a limited extent, but as yet the companies carrying on this traffic were usually working independently of connecting lines and particularly had no connections with water carriers. Where comparisons had been made between this method and ordinary carting with horses the latter had been found to be two and a half times more costly. It was the thought to use these distributing lines at night or at times other than the rush hours.

There was one dissenting voice in the commission's report. Mr. Bensen differed from the others, chiefly in desiring to have the administration of the canals vested in a commission to be created for the particular purpose rather than to have the Superintendent of Public Works continued as the managing head. Mr. Bensen believed that the welfare of the canals demanded their control by a body divorced from any one State administration, of a somewhat permanent character and composed of experts who should give their exclusive and continuous attention to the work. This form of management, he thought, was the prevailing tendency in institutions of public concern, such as canals. In closing his dissenting report, Mr. Bensen says:

"Referring to the summary of the recommendations made by the majority of the Commission, I would respectfully submit the following divergent opinions:

"First.—That the charge of the canal be in the hands of a commission with full power of organization, that they may establish traffic on the new canal.

"Second.—That such a commission, with the approval of the Public Service Commission, be given authority relative to the extension of railroad tracks to all of the canal terminals.

"Third.—That such a commission be given authority to establish joint rates with railroads for carrying on through routes, subject to the Public Service Commission, and to compel the issuance of through bills of lading.

"In regard to the recommendation about terminals and terminal equipment, I would respectfully recommend that this matter be left to the management of a canal commission.

“Such a commission should also, in my opinion, be authorized to fix terminal charges over a commodity handled at the State’s canal terminals, and further, that the commission above recommended have full authority to arrange and to permit the use of the storehouses, piers, cranes, etc., and to permit the construction of graving docks on lands adjacent to the State’s canal lands, and to enact such rules and regulations in regard to the transportation of materials as may be determined necessary from time to time by the commission.

“And, further, authorized to install telegraph and telephone systems along the canal system, and to have whatever authority that will be necessary for the expenditure of moneys to light, repair, and maintain the canal, such as may seem to them expedient in order that proper commercial use may be made of the State’s canal system.”

CHAPTER XIV

A REMARKABLE FEAT — RAPID COMPLETION UNDER RESTRICTIONS AND STRESS OF WAR

Prediction of Completion—New Conditions Tend to Delay Completion—New Incentives Incite to Greater Zeal—State Engineer's Speech—The Goal—Summary of Hindrances—Expedients Used near Rochester—Difficult Situation near Lyons Overcome—Swift Action at Tonawanda Needed—Irondequoit Trough Completed by State Forces—Resourcefulness Solves Baffling Railroad Problem—Energetic Efforts Prevent Bad Slide from Being Fatal Hindrance—Final Work Completed Just in Time—Ceremony of Removing Last Barrier—Comparison with Removal of Last Barrier in Original Erie Canal.

AS THE various sections of the Barge canal were completed, if their locations permitted, they were thrown open to navigation. Additions were thus made from time to time as we have already seen and ordinarily these were regarded simply as natural occurrences in the course of progress, no very unusual efforts being employed to bring them about and little heed being paid to them by others than those directly concerned. But the days shortly preceding the opening of sections that would make the whole new canal from one end to the other available for full-sized traffic were accompanied by rather dramatic scenes. Several years before this period State Engineer Williams in an annual report had predicted that on a certain date the channel would be finished. But between this prediction and its realization the United States had entered the World war and, although new difficulties had arisen to prevent this accomplishment, new reasons had come which seemed to make its attainment imperative and also new incentives were impelling the builders to try the harder to reach their goal. Every patriot was desirous of doing his utmost for his country and because of the assistance a completed deep canal between Great Lakes and ocean might render in emergent war-time needs there fell upon those conducting canal affairs a deep sense of obligation to let nothing short of absolute impossibility stand in the way of opening a full-depth channel at the earliest moment. But, because the war had brought new industrial conditions, it did not seem humanly possible to advance the time of completion ahead of the day already predicted — the opening of navigation in the spring of 1918 — and so the ful-

fulfillment of that promise became a most solemn and compelling patriotic duty to the State Engineer and the members of his department, to the Superintendent of Public Works and his assistants, and to the contractors and their men.

When this prediction was made, at the close of 1915, its consummation while not easy at least did not seem impossible, but as the time drew near and difficulties and hindrances multiplied it appeared on many critical occasions that the way to success was impassably blocked. The story of the weeks and the months of this fight against seemingly insurmountable obstacles is most interesting, especially the account of the latter days of the contest, when again and again some almost tragic mishap occurred or some new and well-nigh insuperable barrier arose, and defeat was turned into victory only by indomitable perseverance and determination as well as the exercise of ready resourcefulness. The men who spared neither strength nor courage in this all but unequal struggle are worthy of high praise. Their patriotism and their zeal demanded as a reward the complete fulfillment of their expectations. That the canal was not allowed to play the part they anticipated was not because of its lack of fitness nor does the fact detract from the honor due these men. But we shall speak of this later.

To read aright this tale of completing the canal in time to serve a military necessity, we must recall the spirit of the times and feel again the thrill of war's impelling motives. Perhaps we can do this best by jumping to the end of the story and hearing first what the State Engineer said on the day the canal was opened. In the evening of that day, May 15, 1918, a company of about a hundred, engineers and contractors, gathered at dinner at the Hotel Rochester in modest celebration of the event. State Engineer Williams was the guest of honor, as being the controlling spirit of the accomplishment, and his speech was reported as follows in a Rochester newspaper the next morning:

"Probably there is no man in the city of Rochester tonight outside of this room—mark the exception—who has greater cause for gratification than I. At a time when it is almost providential in its occurrence the Department of the State Engineer has been able to throw open to public use a route of transportation in that part of the country where it is most needed.

"The war has been in progress a little more than one year, so far as our participation in it is concerned. We are told that food will win the war, that money will win the war, that men will win

the war, and each of these is a factor without which we cannot win, but underlying everything else as a prime necessity is transportation.

"Every true-hearted American is anxious to do his part in making certain that liberty 'shall not perish from the earth,' but this duty is not entirely taken up with the handling of bayonets and bombs and airplanes and artillery. You men who have strained your nerves and worked your hardest to get this canal open, so that it might carry the necessities of war, have rendered to your country a service whose effect on the decision to be reached in Europe may outweigh the work of an entire army corps. Let not one of you regard lightly what he has done or the part he has played. Engineers and contractors alike, you have served the great cause perhaps better than you know.

"I do not know what caused this war — commercial ambition, lack of territory, what not — but I do know that what we have completed today will most certainly be a factor in speeding the war's conclusion, and that after a victorious peace the canal will take the place it was originally designed to occupy — a successful and economical means for peaceful transportation of the products of the industry of the people of the great commercial state of New York."

In the spring of 1916 the State Engineer had taken a careful inventory of what remained to be done in canal construction and had fixed as a goal that which he had predicted shortly before, the completion of the channel throughout its entire length for the opening of the navigation season of 1918. A year later the United States entered the war and immediately all else throughout the country became secondary to what was most essential for carrying on the conflict. It was seen that under the new conditions it would be most difficult to adhere to the original canal program and it would have been very easy and perhaps scarcely reprehensible under the circumstances to have abandoned the effort and thrown the responsibility on unforeseen vicissitudes of war. But the men of the State Engineer's department were not of a temper to accept defeat thus easily and it was decided to put the program through.

Fortunately for the success of the venture these men had but vague prescience then of the difficulties that were to beset the way or the mountain-high obstacles that were to tax their utmost abilities. Most of the difficulties were due to war conditions. Labor and materials had increased enormously in cost and were hard and some-

times even impossible to get at any price. Transportation routes were congested almost to a standstill. Shipments of materials were sometimes lost and often they were commandeered en route for Government construction. Embargoes almost without number were in force against shipments. The necessity of obtaining priority orders to allow any shipments to be made involved vexatious delays and moreover canal work never was given a class "A" priority rating. There was an acute shortage of coal. Men engaged on canal contracts were frequently taken for army service or were drawn into shipyards or munition plants. An extreme instance of this latter practice may be cited. The erection of the railroad bridge at Brewerton was begun six weeks before May 15. If this bridge were not erected, navigation would be blocked. Three full gangs of erectors were lost one after the other within a period of five weeks by being taken to shipyards, but nevertheless on May 15 the bridge was ready. At another railroad bridge, one at Pittsford, much the same thing occurred and this bridge too was completed on time. But to cap it all there were also hindrances not attributable to the war. As the strenuous year of work advanced and unexpected delays occurred, the more necessary it became to increase the speed on the remaining work. This made the winter of 1917-18 one of intense activity. But it so happened that this winter brought more severe weather conditions than had been experienced in many a year.

To appreciate the magnitude and the difficulty of the task we must learn how the several obstacles were met and overcome, and to do this we must examine a few of the more conspicuous of these in detail. In this study we shall see also what expedients were employed when the carrying out of earlier plans was barred. We shall perceive that several pieces of work were so interdependent that the doing of one necessitated the doing of the whole series in proper sequence and failure at any point would have broken the chain and prevented the canal opening. We shall realize how on several occasions the defeat of the whole plan of opening the canal on the appointed day was averted by the narrowest margin. Moreover the pieces of work we are about to examine were not small in volume. One contract alone, that at Lyons, involved a cost of over \$850,000 and required the employment of a large plant of high-grade excavating machinery.

At the beginning of 1917 the greater part of the work remaining to be done was situated in the vicinity of Rochester. It was realized that all which remained in this locality could not be completed by

the spring of 1918, but fortunately much of it was located on the spur that stretches from the main line of the canal to the Rochester terminal harbor. The scheme of canal construction at this point has carried the main channel south of the city and across the Genesee river in a pool formed by a dam which is placed about two miles downstream, in fact almost in the heart of the city. Before 1917 was far gone it became evident that this permanent dam could not be completed and so a temporary structure was erected, which would maintain the pool at the crossing of the river and give a main channel of full depth for through canal traffic. But this plan would cut Rochester off from any possibility of being reached by canal boats during 1918. Accordingly a lock was built in the old canal where the new channel joined it west of the city and the old canal was used for access to the city. Of course only old-sized boats could navigate the old waterway, but it was the best that could be done and Rochester had to be content. Even to carry out this program of expedients unflagging zeal and persistent effort alone achieved success.

In the spring of 1917 it became evident that the contractor working in the vicinity of Lyons would not finish his section in time for the proposed opening. Here was an instance of interrelated pieces of work. Dependent on the completion of the channel in this vicinity was the removal of the Montezuma aqueduct, the structure which carried the old canal across the Seneca river and which had to be removed to make way for the Barge canal channel in the bed of the river. While the aqueduct stood there would be navigation within the old channel; to navigate the new canal the structure must be removed; but with the aqueduct gone and the Lyons section not completed there would be no navigation, either by the old or the new route. It was vitally necessary for the plan of completion, therefore, that there should be no uncertainty about finishing the Lyons work. To insure this result the Canal Board terminated the contract and instructed the Superintendent of Public Works to proceed with the work. With his larger resources he was able to make such progress that it was safe to demolish the Montezuma aqueduct after the close of the 1917 navigation season. Both the Lyons section of new canal and the removal of the aqueduct were completed on time.

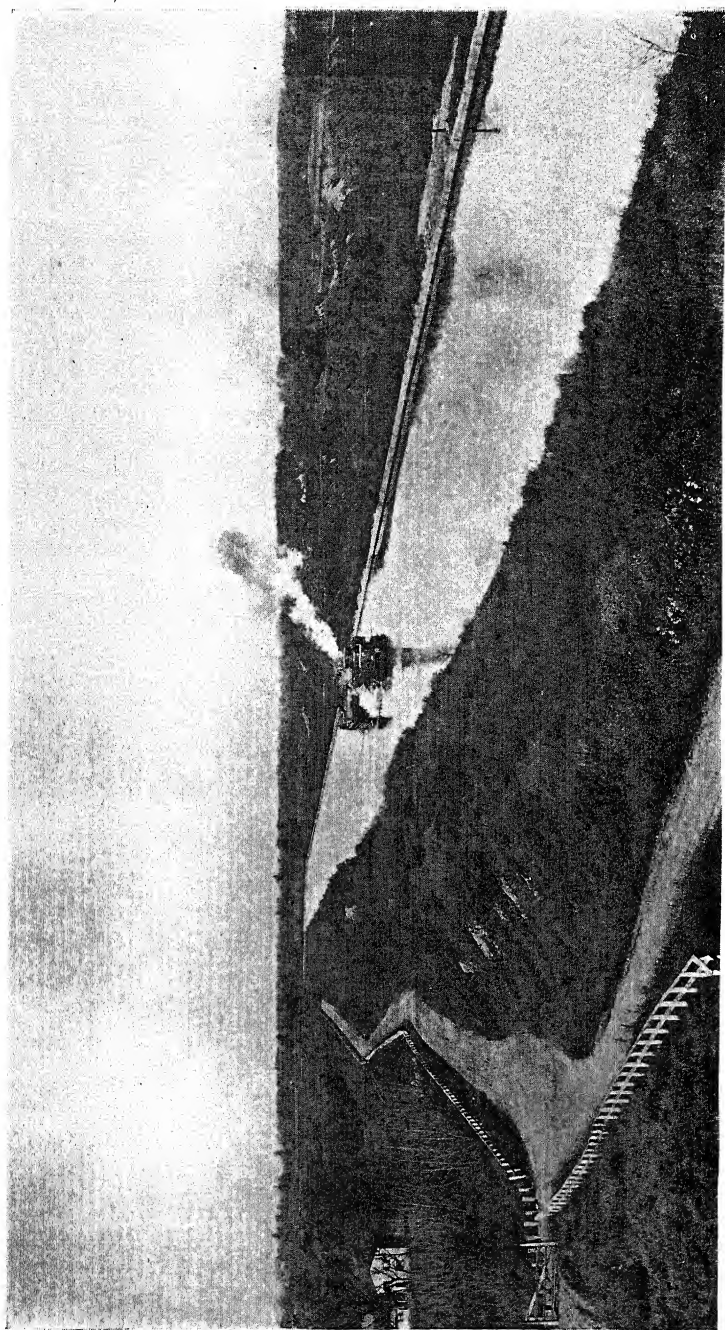
In Tonawanda creek was another case of interdependent conditions. To make possible a Barge canal channel it was necessary to remove a dam which maintained the level in the creek for old canal navigation. This dam had to remain in place of course till

the end of the 1917 season. After it was removed old canal navigation was destroyed and the new channel could not be used till several railroad and highway bridges spanning the creek had been rebuilt or underpinned, and this bridge work could not be begun until the dam was removed. Swift and well-planned action was demanded here.

As the appointed day drew near it became evident that the great concrete trough which carries the Barge canal on a high embankment across the Irondequoit valley and also some adjacent excavating could not be completed on time by the contractor doing the work. With only a few weeks left the State suspended this contract in March, 1918, and undertook the task of completion. By assembling men and machinery from every possible source the Superintendent of Public Works was able to speed up operations and finish in time. In other instances also men or plants were transferred from the less critical to the more critical points. For example, the contractor working on the Rochester harbor was ordered to shift his excavating machines to the main line of the canal.

Only a few weeks before May 15 it was seen that the stringent condition of the market would not allow the Pennsylvania Railroad company to obtain the steel for its crossing of the Barge canal just west of the Genesee river. For a time it seemed as if this failure would frustrate the whole scheme of opening the canal. By ready action, however, it was arranged to divert the entire traffic of this road, first to the Erie railroad, then to the West Shore railroad and then back to the original line. Thus the Pennsylvania embankment could be cut and this was done just in time to let the water through for the opening day.

As the time drew nearer and nearer the tension under which all had been laboring grew more tense. Day and night the work had been going on, three shifts of men being used in some places. Any mishap now, it seemed, would be most disastrous. On May 1 it looked as though the junction lock west of Rochester could not be completed, but by supplying the contractor with men and teams from among those collected for the Irondequoit job delay was averted. Ten days before the date for opening the canal came the mishap which appeared for a while to be the fatal last straw. The banks in a portion of the canal located in Tonawanda creek slid into the channel. At first a delayed opening seemed inevitable, but by most energetic efforts a hydraulic dredge was rushed to the spot and within twenty-four hours after the slide occurred was at work



Channel in concrete trough, across Irondequoit valley. With water in the canal only the tops of the heavy side walls, 96 feet apart, are seen. Two courses of concrete, with tar felt waterproofing, form the bottom. The Irondequoit trough is just three-quarters of a mile long. Maximum height of top of embankment above valley, 60 feet.

reopening the channel. At the guard-lock east of the Genesee river, however, was enacted the most dramatic scene of all. Night and day the men worked and on the morning of May 15 with the incoming canal water rising around their waists the final work was done. This was also the final work of all that needed to be done before a Barge canal channel of full depth could be opened across the whole state from end to end of the new waterway. The seemingly impossible task had been accomplished; the canal was opened on the appointed day.

We can appreciate now with what satisfaction the men gathered on the evening of May 15 in unpretentious celebration. These were the men, the comparatively small company of engineers and contractors sitting there at dinner, who had led the forces in the mighty undertaking which had culminated that day in success. But the world did not applaud. It was at grips with death just then and did not so much as hear of the event. Even the people of New York state were too absorbed to give it more than a passing glance. In peace times this would have been a momentous occasion. In reality it was significant, but everybody was then engaged in heroic tasks and this passed as but one among the many such deeds.

A few days earlier there had been a very modest ceremony connected with the last stages of preparing the canal for opening. The new canal channel on both sides of the place where it crosses the Genesee river had been dug as dry excavation, since more rapid progress could be made by that means, and a narrow dike had been left at each river bank. On May 10, in the presence of a small company consisting of members of the engineering staff and a few prominent citizens, State Engineer Williams, with a shovel taken from one of the laborers, opened a ditch across the dike at the western bank of the river, letting the waters of the Genesee through to the new channel. This was the last barrier in the whole new waterway. A half hour earlier the dike at the east river bank had been similarly cut.

By way of comparison it is most interesting to refer to what the chronicler of the original Erie canal had to say concerning the removal of the last barrier to through navigation on the first State waterway. The place of final work was at what the early builders termed the "mountain ridge," just west of Lockport. Here was "the spot," said the narrator, "where the waters were to meet when the last blow was struck," and where "nature had interposed her strongest barrier to the enterprises and the strength of man." This

phrase indicates a marvelous difference between the two undertakings. To the earlier builder the excavation of rock was a supreme difficulty. But no longer has rock excavation the terrors of old. The wide and deep channel of the Barge canal through many rock cuts has occasioned no anxiety. Modern machinery has wrought the change. A comparison of the methods employed at this mountain ridge in building the first and the latest canals presents at least one particularly interesting commentary on the differences of the times. Hand labor and crude horse-driven derricks were the tools of the early builder. For the Barge canal the old cut through this same mountain ridge has been deepened and widened, but in doing the work man used his head instead of his hands. The great cataract at Niagara, operating through powerful modern machines, was the *génie* which the builder of today commanded to carve the new channel.

CHAPTER XV

UNITED STATES CONTROL

Canal Completed in Time for War Use—High Hope of Result of Government Control—Call for State Canal Convention—Marshaling National Transportation Media—Government Investigates Barge Canal—Action by Canal Convention—Delays—Government Assumes Control—Announcement Hailed with Joy—Disappointment Follows—Nature of Federal Control—Review of Situation by Mr. Gardner—Interview with Director General of Railroads—Unsatisfactory Results—Superintendent Wotherspoon's View of Federal Control—Other Views—Clamor for Return of Canal after War—Official Opinions on Effect of Continued Control—Federal Domination Somewhat Lessened—Control Transferred to Secretary of War—Opinion as to Reason for Action—State Attempts to End Control—Hearings on Resolution to Return Canal—Government Operation Continued Another Year—Résumé of Federal Control and Arraignment for Its Inefficiency

WE HAVE seen how by almost superhuman efforts the State Engineer and others of his department, assisted by the Superintendent of Public Works, the contractors and their many workmen, had succeeded in opening a channel of full depth throughout the entire length of the Barge canal for the beginning of the 1918 navigation season. It was a magnificent spectacle. Driven by the spur of unselfish patriotism each had done his bit to complete the canal, and now it was ready to serve the Federal government in a great emergency, even at the time of its supremest need; it could relieve a congestion in the transportation of war munitions and equally essential industrial commodities that was becoming well-nigh perilous.

A few weeks before the canal was finished it had been announced that the waterways of the country had been taken over by the Federal authorities and would be operated, together with the railways, as emergent war transportation media. With considerable self-satisfaction, therefore, the people of the state, and especially those who had labored so hard to accomplish this result, congratulated themselves that they had thus been permitted to render no small service to their country, even deeming the opportune completion of the Barge canal at this time almost providential. If this were all of the story, we also could contemplate the event with equal

satisfaction, but the sequel presents a different tale. From the magnificent picture of exalted selflessness we turn, if we may credit the evidence, to one of sordid selfishness. We might almost consider the denouement amusing, were it not so serious. Perhaps it is indeed a rare joke to the opponents of the canal, certainly not to its friends. The account of Government control of New York waterways surely forms an interesting chapter in Barge canal history but in its ultimate outcome it is one which cannot be recalled with any complacency by canal supporters. Urged upon the Federal authorities through a high sense of patriotic duty, this control fell to a base misuse of authority for selfish ends; acclaimed as a means whereby years would be saved in building up a Barge canal traffic, it proved in the end to be almost a death blow to any hope of a successful traffic on the new waterway.

But to follow the history of this movement we must turn back to the early days of America's entrance into the World war. The first concerted public action in this matter resulted from the calling of what was termed, for the want of a better name, a State Canal Convention. This body met in Albany on August 1, 1917, its purpose, according to the language of the summons, being "to consider and devise measures to bring the Barge canal to perform the world service of which it is capable, to bring its great value as a means of transportation to the immediate attention of the national government, and to secure the cooperation of the Governor and the Legislature of this state for the achievement of these purposes" The initiative in issuing this call was taken by Frank S. Gardner, secretary of the New York Board of Trade and Transportation, but in reality the convention had been for some time in the making and was but the natural outcome of the unusual situation then confronting the country.

Prior to this convention, however, the subject had received much thought and attention and various activities related to it had been started. When the country had passed from a state of neutrality to one of belligerency it began the mighty task of marshaling its resources, a task made greater by the very abundance and diversity of those resources, and among the multitudinous problems it encountered, that of transportation permeated them all. Those in Washington who had to do with these matters appreciated the important place waterways held in any plan to utilize to the full the transportation agencies of the country and accordingly the Department of Commerce, after a quick survey of the situation under the

personal direction of Secretary Redfield, had inaugurated a campaign for bringing about the use of these waterways, appealing to the country for a full utilization of existing facilities and urging upon citizens and communities the rehabilitation of worn-out and the building of new equipment. Then a bureau of inland waterways was organized in the Department of Commerce, with a transportation expert at its head. This department was working in close coöperation with the National Council of Defense, which also had appointed a special committee on waterways. In addition State Engineer Williams and Superintendent of Public Works Wotherspoon tendered to the Government the canal as it then was and offered their own services and those of the State to hasten its completion as soon as was humanly possible. Because of his former army position and acquaintances General Wotherspoon's words carried especial weight. Also George Clinton brought the matter to President Wilson's attention and was personally assured by the President that he would place the subject before the proper authorities with his full approval.

This agitation brought the Barge canal prominently before the Washington authorities and as a result the National Council of Defense appointed a subcommittee to tour New York state and investigate the canals. The report of these men was not made public, but it is generally thought that their impressions were not altogether favorable, at least so far as the immediate use of the canal was concerned. At that time, it will be recalled, certain stretches of the new canal were still to be completed, new shipping had not been built and the supply of old boats was deplorably inadequate. General Wotherspoon said that the two men constituting the committee to tour the state came in response to his correspondence with General William M. Black, the chairman of the committee on Inland Water Transportation, and were accompanied on their trip by members of his department, also that they expressed themselves as satisfied that the canal itself possessed all the physical and economical elements required for success, but that, as was obvious to everybody, the boats to make possible this success were lacking.

There was an apparent disposition on the part of all concerned, however, to utilize New York's waterway, but in spite of all that had been done, tangible results did not follow, either in using the canal or in preparing to use it, and the canal enthusiasts of the state grew restive. Believing profoundly that the Barge canal would be New York's greatest war contribution to the nation, they

were impatient of any delay in its service, and so the convention of August 1, 1917, was called.

This convention was attended by representatives of the State Waterways Association and many civic bodies, also the mayors of cities and numerous other prominent persons. Its action took the form of petitioning the Legislature, then convened in extraordinary session, to memorialize the President of the United States, the National Council of Defense, the Secretary of War, the Secretary of Commerce and the Committee on Inland Waterways, calling attention to the availability of the New York canals and urging their use to the fullest possible extent. The backing sought by this convention was obtained. The Canal Board by action of August 21 endorsed the movement; the Legislature three days later memorialized the Federal authorities and Governor Whitman formally transmitted the documents to President Wilson and other officials at Washington.

But it was several months before any definite action was taken. Meantime the canal was nearing completion. On January 31, 1918, State Engineer Williams appeared personally before the Senate Committee on Commerce, in the course of its investigation of matters connected with the building of merchant vessels under the direction of the Shipping Board Emergency Fleet Corporation, and informed the members that the Barge canal would be open throughout its entire length the following spring, but that boats for use upon it would be sadly lacking, and moreover that it was virtually impossible for private enterprise to construct boats, and if the canal was to be utilized as a military adjunct, it became the duty of the Federal authorities either to build the floating equipment or to assist by some method in providing it. Also various plans were submitted to the Government by individuals and these generally involved financial aid to private canal transportation companies, which it was proposed to organize.

Finally, however,—on April 10, 1918,—members of the inland waterways committee appointed by the director general of railroads, Mr. McAdoo, appeared before the Canal Board and requested the cooperation of the authorities charged with administering State canal affairs in an effort to bring about a coordination in the use of the railroads and the State canal system during the period of the war. This was just what canal men had been striving for and the Canal Board gladly assented. In the words of its resolution it “assured the director general that the officials of the

State of New York in charge of the operation and maintenance of the canals of the State were ready, willing and anxious to cooperate with the director general in the utilization of the canals to the fullest possible extent." A special committee of the Canal Board, in company with the Federal committee, at once waited upon the Governor and an expression of the willingness of the State to cooperate with the National government in its plans was formally transmitted by him to the Washington authorities. On April 18 formal announcement was made by the director general that he would secure boats and establish an operating organization to utilize the State canals.

This announcement was hailed with joy. Some persons went so far as to say that this use of the new waterway in the time of the nation's direst need would justify the cost of its building even if it were never used afterward. Canal advocates, besides being pleased because they seemed to have builded better than they knew, saw in the action of the Government the promise of an unexpected ally, nothing less than that which appeared likely to accomplish in months what it would naturally have taken years to bring about. They had realized what a herculean task was before the canal in the building up of a traffic, how only by years of unabating toil could commerce accustomed to other lines be diverted to the canal. Here was the hope that by what may be considered artificial means this metamorphosis was to be attained. Here was a supreme power, having absolute authority over all transportation, that at will could route traffic where it pleased. The usual courses were choked and it seemed inevitable that the canal would get a large share of this traffic.

But their dreams were not to come true. Neither were the expectations of the people of the state at large to be realized concerning their supposed munificent contribution to the country's emergent need. Gradually it became evident that these fair hopes were doomed to disappointment. First came the announcement that canal and rail rates were to be equal. Later this ruling was changed and canal rates had a twenty per cent differential. The official announcement that no private lines would be allowed on the canal elicited such a storm of protest that it was followed by a disavowal of any intent to forbid private operation of boats. To state in a word the history of Government control over New York canals it may be said that apparently the transportation lines were operated solely for the benefit of the railroads and that private companies

were in effect excluded from the canal because no one under existing circumstances would compete with the Federal government. Canal men believe that the railroad interests dominating the Government control deliberately misused their temporary authority to injure the canal, but of course positive evidence of such purpose is lacking. The retention of the waterways, however, after the railways were turned back to their owners, seems to indicate that some influence ill-disposed toward canals was working. But we shall let the men who were in close touch with the whole situation tell the story in their own words.

First, however, it may be well to explain the nature of the Federal operation of the New York canals. People in general had little understanding as to what had actually taken place. The State did not lose possession of its canals; under the Constitution it cannot. Moreover it still continued to maintain and operate both the channel itself and its structures, just as it has always done, bearing all the expense of this operation. The State's position in regard to its canals was scarcely changed in any particular. Unlike its administration of the railroads the Federal government did not guarantee the payment of dividends nor provide for the upkeep of the property, nor in fact did it assume any financial obligation whatsoever connected directly with the canal itself. This fact should be remembered for a better appreciation of the Government's attitude toward the canal, as it is revealed by the men we are about to quote. What the Government really did was something which the State had never done, namely, to take over control, either directly or indirectly, of the floating equipment on the canal. Its position was somewhat analogous to that of a large transportation company which was building boats and operating them on a State-owned canal. It obtained control of a large proportion of the boats that had been in use during recent years and built some new boats. The Government, however, was much more than a mere transportation company, for it stood ready to control all shipping on the canal, assuming the right under authority of Congress to commandeer any and all boats doing business on the waterway and even to direct the activities of those it did not commandeer.

At the convention of the State Waterways Association on November 7, 1918, Frank S. Gardner, the man who had conceived the idea of the special convention of August 1, 1917, told of an interview certain New York representatives had with the director general of railroads. What he said is enlightening. It runs as follows:

"Mr. President and Gentlemen: At the request of Senator Hill, I have put on paper a few facts regarding our interview with Mr. McAdoo in Washington on the 25th of last month, what he said, and the result of his policies.

"The conditions existing upon the canals of the state which have been created by the policy of the Railroad Administration constitute a cause for much concern to the state and to all of her business interests, and I venture to suggest that this Association at this time consider what steps should be taken to protect our business interests under the circumstances.

"Most of the gentlemen here present are aware of the fact that the New York State Barge Canal Conference met at Albany on August 1, 1917, and petitioned the New York State Legislature, then in extra session, to memorialize the officials of the United States Government and to urge them to make the fullest possible use of our state canals for transporting to the seaboard the food and military supplies to maintain our armies, and the food and other supplies for the armies and people of our Allies abroad; that the New York Legislature on August 24, 1917, did so memorialize the Federal Government and that such memorial was formally transmitted by Governor Whitman to President Wilson and other principal officials.

"Some eight months elapsed without any definite action in the matter by the United States Government. At the end of that time the Federal Railroad Administration announced that it had taken over control of navigation upon the canals of this state. The general public were quite in a dilemma as to what actually had been done and the officials themselves of the Railroad Administration appeared to be in some confusion, because they and their representatives made announcements which were generally understood to extend Railroad Administration control over all operations of all boats upon our canals.

"Shortly prior to June 25, 1918, the Railroad Administration announced that canal and rail rates would be upon a parity, and that the usual differential would not be allowed to freight via the canals.

"This order as issued was understood as applying to all freight carried by canal whether in boats operated by the Railroad Administration or by private individuals and corporations. In fact a circular issuing from the office in New York of the Canal Section of the Railroad Administration announced that no private canal lines would

be permitted to carry freight upon the canals for their own account. This caused consternation among shippers and carriers by canal and was regarded as a calamity to this state and all of its business interests.

"The situation into which our canals were thus apparently brought was the subject of unfavorable criticism by a number of influential organizations and by many important newspapers, and soon elicited from the Chairman of the Canal Section a disavowal of any purpose to forbid private operation of boats.

"This public discussion was followed by announcement by the Railroad Administration, published June 23d, that the rail rates would be advanced 25 per cent on June 25th, but that the canal rates would be allowed to remain at the then existing rail rates. This was a partial recognition of the natural difference in rates between rail and canal and was made after a call had been issued for a meeting of the New York State Barge Canal Conference to be held in Albany on June 26, 1918, to consider the situation.

"The Barge Canal Conference on June 26, after full consideration adopted an address to the Director General of Railroads, expressing the views of the Conference, and appointed a committee to submit such views to the Director General in person. It also appointed a special committee of traffic men to prepare a statement showing the relation between rates by the canals and by the railroads, and the rates which should be charged upon them, respectively, and the reasons for a substantial difference between them.

"The Committee of the Conference was unable to get an appointment with Mr. McAdoo until the 24th of last month, nearly four months elapsing, and they then proceeded to Washington. On Friday morning, October 25th, they met Mr. McAdoo, who was attended by Judge Edward Chamber, Director of Traffic, Mr. Carl Gray, Director of Operation, and Mr. Oscar A. Price, all of the Railroad Administration.

"It was my privilege to be present at this interview, and several gentlemen who are attending your meeting today were also there. I listened with much interest and attention to what Mr. McAdoo had to say. The interview covered fully an hour and a half, and while much pleased with Mr. McAdoo's courtesy, patience and frankness, I was soon impressed with the fact a most grievous mistake had been made by our Barge Canal Conference on August 1, 1917, in appealing to the Federal Government to make use of our canals. In saying this I must confess that I had a part in bringing

about the action of August 1, 1917, which to me now appears to have been so fatal to the very object we desired to accomplish, viz.: to induce the Federal Government to take such measures as would result in the greatest possible use of our canals.

"I am now convinced, from what Mr. McAdoo said to us on October 25th, that the measures he has adopted and the policies he proclaims, will not result in the greatest use of our canals, but will wholly subordinate their use to the enhancing of railroad revenues and the non-use of the canals wherever their use can be avoided.

"With much frankness Mr. McAdoo assured us that boats when operated by private individuals or corporations would not be interfered with; that they could charge any rates they saw fit, and he was willing to guarantee that private boats would not be commandeered by the Railroad Administration, but as to this he could not speak for the Army or the Navy.

"In response to an inquiry referring to building new boats for private operation he said: 'If so much steel as would be needed to make a tenpenny nail—and it is just about as close as that—should be needed to carry on the war it would have to be so used and could not be devoted to building canal boats.'

"It was also brought out that the Railroad Administration had started practically all the usable existing boats, and as the discussion proceeded it was quite clear that, notwithstanding the promises of non-interference of private operation of boats, the obstacles created to private operation were insurmountable.

"He said that a number of steel boats and a number of concrete boats were being constructed for the Railroad Administration.

"He asserted that the Railroad Administration has full power to route all freight by such lines as it thinks proper, and, upon inquiry, defended the policy of sending boats empty from New York to Buffalo on the ground that to send them loaded, 'at any old rate,' would reduce the railroad revenues. He said he could not approve of the boats created by the Government taking rates so low as to reduce the revenues of the railroads.

"Mr. McAdoo was asked if the Railroad Administration would be willing to make arrangements by which freight could be shipped to interior points in the West or from such points to the East, via rail and canal on through shipment and through bill of lading, giving the freight the advantage of the lower canal rates for the water portion of the carry.

"Mr. McAdoo said he did not think the Administration could do that because it would destroy their rail rates.

"This being the policy of the Railroad Administration, for which Mr. McAdoo declared himself alone to be responsible, will result in subordinating the canals to the railroad policy and will keep canal rates upon an approximate parity with rail rates, and he further plainly intimated that, having the power to route all freight, it will not be routed via the canal so long as the railroads can carry it. This, manifestly, must dispel all hope for the greatest possible use of the canals in the near future or during the continuance of Railroad Administration control of navigation on the canals.

"In conclusion, therefore, I repeat what I said in the beginning. The conditions existing upon the canals of this state which have been created by the policy of the Railroad Administration, constitute a cause for much concern to the state and to all of her business interests, and I venture to suggest that this Association, at this time, consider what steps should be taken to protect our business interests under the circumstances." *

General Wotherspoon spoke at this same convention. The following words of his concerning Federal control are worth quoting:

"If any discussion were to be had as to the disadvantages of the Federal control of canal freight, I would mention particularly the fact that the entrance of private capital into the field was absolutely discouraged. Three reasons have been advanced for this condition. First, the available Erie Canal boating equipment had been secured by the Government, and individuals could not accomplish the construction of new craft in time to be used the present year, since no materials for boat construction could be obtained without the greatest difficulty.

"Second. The understanding that private companies, if formed would have been compelled to operate under the supervision of the United States Railroad Administration, with no guarantee that their boats would not be requisitioned by the Government for other purposes

"Third. That no private companies cared to compete with the Federal authorities in canal business.

"It is true, of course, that so far as the second and third reasons are concerned, about mid-summer an effort was made by the National Government to relieve the impression that the field was not open also to independent carriers, but such announcements

* Ninth Annual Report, N. Y. State Waterways Association, pp 48-51.

came too late for practical purposes during the present year at least. In this connection it is significant to note that from the day the announcement was made that the movement of canal freight would be controlled by the Federal authorities, I have had scarcely a single call from any interest having in mind the formation of a private boat company, while previous to that date hardly a day passed but the subject was discussed with one or more callers." *

In General Wotherspoon's opinion, however, the advantages of Government control during the first year of the new canal's operation outweighed the disadvantages. It was of the utmost benefit to the waterway during this season, he declared, that traffic should be under a centralized control, rather than that boats should be operated as individual units, as had been the general practice theretofore, and also that such service as was furnished should have been rendered by a dependable and responsible carrier. He considered, moreover, that the general merchandise service which the railroad administration had inaugurated at his suggestion was a long step toward bringing home to the citizens of the state the advantages of waterway transportation. Also in 1918 for the first time rates had been stabilized by publication in tariff form. He doubted whether the transportation of freight on a large scale could have been accomplished during the year without Federal control. As a matter of fact there was a complete absence of prospective carriers in sufficient numbers a year earlier. The field was carefully investigated at that time by the subcommittee of the National Council of Defense, as we have already seen, and while several companies then claimed a corporate existence none was ready actually to engage in business without considerable financial aid from the Government.

Although General Wotherspoon held this favorable opinion of the season's traffic, at the same time he advocated that Federal control should continue after the close of the war no longer than would be required to adjust business conditions on a peace basis.

A view of the situation which existed subsequent to the war is found in the following quotation. It comes from a paper read before the State Waterways Association on November 20, 1919, by Edward T. Cushing, of the New York Produce Exchange.

"It is for the interest of the government," he said, "to kill any competition of the canal with the railroads, for even if the railroads were returned to their owners, the government would

* *Id.*, p. 41.

still guarantee their earnings. No sane man will compete with the Federal Government. What an object lesson in paternalism! The fear of it is today paralyzing the operation of the greatest inland waterway in the world. Here is the biggest thing ever played for in railroad history. The stake—one hundred and fifty million dollars of the people's money invested in the Barge canal; the contestants—the United Railroads, backed by the Federal government, against the people of the state of New York.” *

Another quotation, this time from an address made by Edward S. Walsh, Superintendent of Public Works in 1919 and 1920, before the State Waterways Association at this same 1919 convention.

“I made every effort,” said Mr. Walsh, “to persuade the United States Grain Corporation to utilize the canal facilities, but without success. Explanation for the failure of the Grain Corporation to employ the water route, particularly when it was announced broadcast throughout the country that a serious car shortage was impending, did not explain. I, therefore, am forced to the conclusion that the routing of grain from Buffalo by rail to the utter exclusion of the canal, was either the result of poor business judgment or discrimination of the rankest nature against the waterways of the state.” †

With the war at an end and no longer any reason existing for continuing Federal control, State officials and canal advocates began clamoring for the Government to relinquish all authority over canal traffic and to cease operating its boats. But again they were doomed to disappointment and for two seasons more the United States authorities retained their hold on the canal.

Of the effect of this experience State Engineer Williams says in his 1920 annual report, “The designers of the canal had contemplated that it could not be expected to reach its maximum carrying capacity within a period of less than five years and this conclusion was arrived at without foreseeing the conditions of war, which have completely upset the ordinary and usual economic development that could have been reasonably looked forward to. In view of the almost prohibitive costs of material and equipment, it is doubtful if any new transportation medium of whatever nature

* Tenth Annual Report, N. Y. State Waterways Association, p. 16.

† *Id.*, p. 45.

could reasonably be expected to attain any marked development within the two and one-half years since the Barge canal has been opened. Our present rail transportation systems show little signs of material recovery from the staggering blows dealt them during the period named, although prior to the war they were justly presumed to be developed normally with the increased demands made upon them. To my mind, development of transportation on the canal has been set back fully three years, owing to the conditions through which we have passed and are now passing."

From the Superintendent of Public Works we hear further of this baneful influence and also learn what changes were taking place in the status of canal control. In his annual report, presented to the Legislature on January 15, 1920, Superintendent Walsh said:

"The task of restoring traffic to the waterways is a difficult one at best and nothing must be permitted to stand in the way of its progress. The first requisite in the undertaking is the formation of many strongly-financed, well-equipped carriers. I find there are men who look with favor on canal transportation projects and are eager to engage in the business under certain conditions, and one of the controlling conditions is that Federal utilization, control and jurisdiction of the waterways be discontinued. Few, if any, shipping men are willing to compete with a subsidized Federal canal service that operates without regard to cost and that assumes no obligation to produce a profit from its operations. The situation on the canals, therefore, if new companies are to be formed who will provide a service that will build up the tonnage, demands the termination of Federal control or utilization.

"I had believed the termination of the Federal Control Act, returning the rail system to their owners, would free the waterways from the obstructing Federal influence. Transportation legislation pending in Congress, however, does not definitely establish the status of the inland waterways on which the government had operated barges and it is proposed to transfer the government's inland waterway activities from the Railroad Administration to the United States Shipping Board, to be dealt with by the Shipping Board under the provisions of the 'Shipping Act, 1916.' If, in this manner, the government should continue its canal operations through the agency of the Shipping Board, the situation would be unchanged. There would still remain in operation a governmentally subsidized transportation service with which private enter-

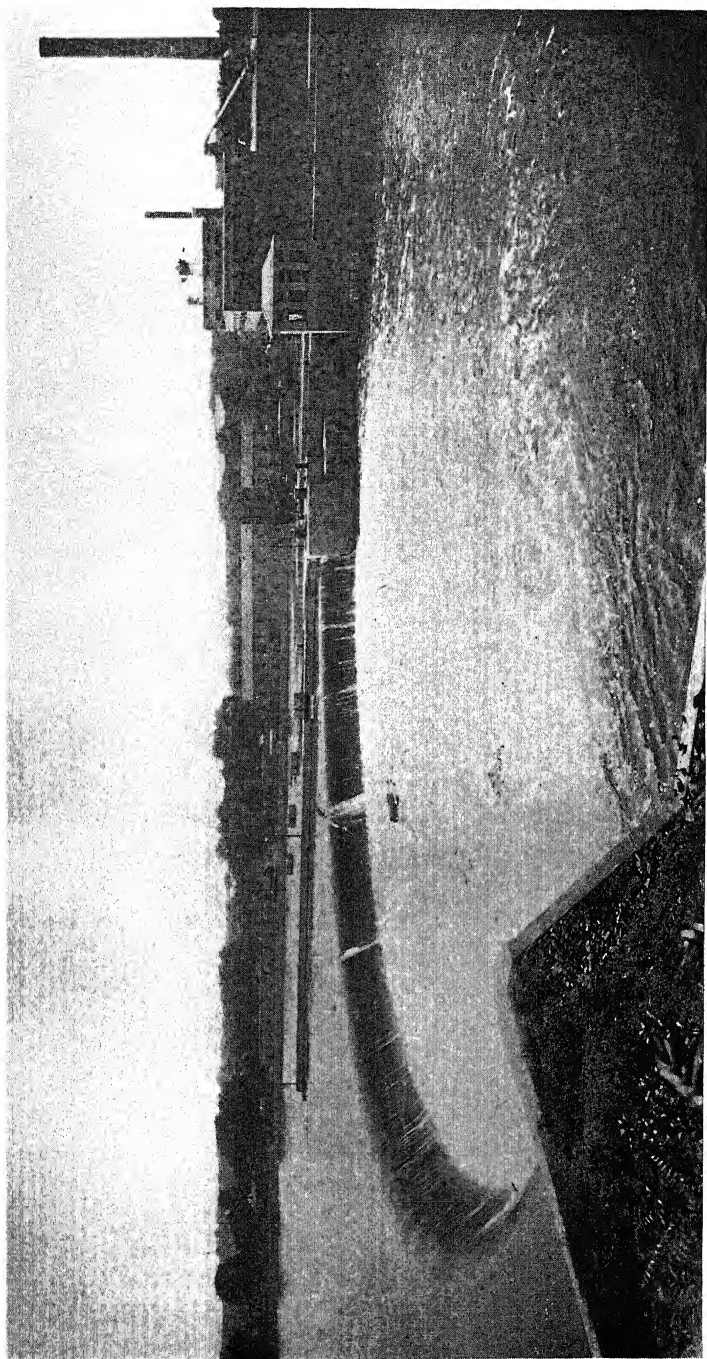
prise is reluctant to compete, in fact, with which it declines to attempt to compete.

"I do not understand that the Shipping Board is authorized under the Shipping Act to operate vessels or barges it controls, but must permit of their purchase, lease or charter when persons or corporations came forward with a proposition that satisfied the terms and conditions of the purchase, lease or charter prescribed by the Shipping Board. If, therefore, pending legislation will be the means of terminating the Federal government's activities on the New York waterways and of releasing government barge equipment for private operation, the problem confronting the State is solved. On the other hand, if the measure now before Congress does not have such effect, I urge upon your honorable body the imperative necessity of the introduction in Congress and early passage of legislation that will rid the waterways of the State of the destructive governmental operation."

In 1919, however, Federal domination was somewhat lessened in degree. This was brought about largely through the efforts of Superintendent Walsh and we shall let him tell of it in his own words. In this same annual report he said:

"In view of the disastrous effect of Federal control of canal rates and equipment, as practiced by the Federal government during the 1918 season of navigation, determination was reached early in the year to limit and modify the extent of Federal jurisdiction.

"Several conferences were held with officials of the United States Railroad Administration and agreement reached as to the scope of the Federal government's activities during the 1919 season of navigation. First, the Railroad Administration agreed to waive its option of recharter on the 100 or more individually owned barges that it operated during 1918. By this agreement the independent barges were released for operation by their owners. Second, the government agreed that it would not control or attempt to control, either directly or indirectly, the operations of such independent canal carriers as might be established nor the local rates such carriers might publish. Third, the government agreed to operate the barges it had built in a through Buffalo-New York service exclusively and would not enter into competition with independent operators in the intermediate territory. Fourth, the Railroad Administration officials agreed that they would not attempt to influence the movements of the grain traffic from Buffalo and



Fixed dam in the Oswego river, at Minnetto. Nearly all of the Oswego canal is a river line, both old and new dams being used to effect this canalization. View shows a new curved dam of gravity type, built on the eastern side of the river, a lock in the center and power-plant head-gates on the western side.

that independent operators might compete for such traffic on equal terms with the government barges. Fifth, the government agreed to establish a line of rates applying from New England and New York via canal and lake to western territory and would restore a service on the Great Lakes to Lake Michigan ports. Sixth, the government consented to establish canal and rail rates through all practical points of interchange if and when traffic was created making such rates necessary."

Early in 1920 the railroads of the country were returned by act of Congress to their former private owners. It had been supposed that Federal jurisdiction over the New York canals also would cease whenever the railroad systems were given back. They had been taken under authority of the same act as the railroads, known as the Federal Control Act, and moreover it had been the understanding of New York State officials that Government tenure was merely for the period of the war. When the bill to restore the railroads was pending in Congress it was said that some provision would be incorporated which would have to do with the policy of the Government towards inland waterways. Accordingly those in charge of canal affairs in New York were at considerable pains to caution the representatives of the State in Congress against permitting anything to be embodied in the bill which would continue Federal activities on the New York canals. Also inquiry of the conference committees of both Houses having the bill in hand brought the response that there was no provision that in any way affected adversely the New York canals. Shortly before the passage of the bill, however, it was learned in New York state that this assurance was in error. The bill as proposed by the conference committee provided that all barges on inland and coastwise waterways acquired by the United States in pursuance of the Federal Control Act were to be transferred to the Secretary of War and operated by him, so as to continue the lines of inland water transportation established during Federal control. The meaning of this provision was clear. Under it Government operations on the New York waterways would be continued. The New York members of Congress were immediately urged to have the bill amended so as specifically to exclude New York canals from its provisions. The sponsors of the bill, the chairman of the House Committee on Interstate and Foreign Commerce and the chairman of the Senate Interstate Commerce Committee, both declared that prior to the drafting of this section of the bill they had been informed that the

Government had not taken over any transportation facilities on the New York canals nor was it engaged in operating any boats on them. Moreover, they were both opposed personally to such operation if it was not desired by the people of the state.

The explanation of this occurrence we can only guess at. Superintendent Walsh's interpretation, however, is illuminating. He says, "The inclusion of section 201 in the Railroad bill in the form in which it was submitted to Congress unquestionably resulted from a deliberate misstatement of facts by the person or persons with whom the Conference Committee consulted. It is inconceivable that the information given the Congressional Committee was founded on ignorance and if so such ignorance of the activities of the Government by Government officials is appalling. It is my personal belief whoever imparted the information to the Conference Committee as to the inland waterway activities of the Government wilfully concealed the truth as far as the New York State Canal situation was concerned."

Because of the importance to the whole country of the chief features of the bill, it could not be delayed to revise one relatively small item, however much that was desired by those directly interested. Accordingly the bill was passed, but shortly thereafter Senator Wadsworth introduced a resolution to exempt the Barge canal from its provisions.

On March 17, 1920, the State Canal Board adopted a strong resolution disapproving the continuation of Government operation of barges on the New York canals and declaring that in justice and fairness to the State all canal equipment used or acquired by the United States for Barge canal operation should be transferred in ownership to the State as a partial return to the State for furnishing, solely at its own expense, a waterway connecting the Great Lakes with the seaboard and placing it at the disposal of the Nation, and particularly in part compensation for what had resulted from the Government's canal operations in 1918 and 1919.

Immediately following this action the State Legislature passed a concurrent resolution of the same tenor as that of the Canal Board, but going farther and actually requesting the transfer of the fleets to State ownership. Copies of this resolution were sent to the United States authorities.

A hearing on Senator Wadsworth's resolution was called by the Senate Committee on Interstate Commerce, at which New York canal representatives appeared and argued that Government opera-

tion was inimical to the successful development of commerce on the State waterways and prejudicial to the best interests of the people of the state. The resolution was favorably considered by this committee and was passed by the Senate.

At the hearing before the House Committee on Interstate and Foreign Commerce the State commercial interests were again represented in force and once more they protested against a continuance of Government operation on the New York canals. The Secretary of War, on the other hand, vigorously opposed the resolution, and representatives of his department painted a wonderful picture of what splendid results would attend the continued operation of Government barges on the State canals under the direction of the War Department. And as a cap-sheaf for New York's humiliation, in the light of her former magnanimity, representatives of the South appeared before the committee and insisted that if the Government were to cease its activities on the New York canals then the boats it had constructed or was constructing for that service should be transferred to the Mississippi and Warrior rivers.

We shall let Superintendent Walsh tell how this action ended and also what happened on the canals during the ensuing season. In his report for 1920 he said: "Congress adjourned before action was taken by the House of Representatives on Senate Joint Resolution 161 and the Federal government, under direction of the Secretary of War, through the Inland and Coastwise Waterways Service, administered by the chief of the Army Transport Service, has operated a fleet of 95 barges on the waterways of the State during the navigation season of 1920. The equipment operated by the Federal Government is supposed to be the last word in inland waterway barge design. The power units employed cost nearly \$100,000 each. Twenty steel steamers, twin screwed, having 400 I.H.P. each and cargo capacity of 350 tons were in service. Fifty-one steel barges, 150 feet long, 20 feet wide, 12 feet deep, with a cargo capacity of 630 tons each; twenty-one concrete barges, 150 feet long, 21 feet wide, 12 feet deep, with a cargo capacity of 520 tons each, and three wooden barges of the same general dimensions were operated. The total cost of the fleet was approximately \$4,500,000."

We desire to add another quotation from Superintendent Walsh. He gives in this same report a brief résumé of Federal control on the New York canals in 1918, 1919 and 1920, the three years during which that control was in force. It is as scathing and as

fearless an arraignment of Government operation as the most rabid and the most sorely disappointed canal enthusiast could desire. It reads as follows:

"The Report of the Director of Inland Waterways of the United States Railroad Administration for the year 1918 excuses the failure of government operations on the ground that the equipment to be had was obsolete and inadequate and the time permitted for the mobilization of a fleet and perfection of an operating organization was too short to permit of efficient results

"The report of the Government for the fiscal year 1919 shows a loss of \$506,807.38. The failure of operation is admitted but excused on the ground that the modern power units contracted for had not been delivered and such tow boats as were available for the movement of the new steel and concrete barges that had been delivered were inadequate.

"The report of the Chief of Inland and Coastwise Waterway Service for the fiscal year 1920, comprising only 45 days of the navigation season of 1920, shows a loss of \$62,670.14. The deficit for the entire season of navigation will unquestionably exceed \$500,000. Throughout 1920 the government had in service its full complement of floating equipment, the most modern and most costly of any on the State waterways. The season's cargo capacity of the fleet if operated with reasonable efficiency would have been approximately 600,000 tons. The alleged causes for the failure of operations of 1918 and 1919 did not exist in 1920 yet the results were relatively far more disastrous. The government barges carried 197,017 tons during the season of 1920. In my 1919 report I showed that while canal commerce increased 7 per cent in 1918 that proportion carried by the government line decreased 2 per cent. During 1920 the government barges carried slightly less than 14 per cent of the season's total tonnage, their proportion decreasing another 2 per cent despite the fact the very best equipment to be had was operated by the government and traffic was available in large volume, increasing about 15 per cent in total. A comparison of the barge activity of the government fleet with barges operated by others shows that the type of equipment characterized by the government in 1918 as 'obsolete and inadequate' worked with much greater efficiency. The War Department fleet engaged almost exclusively in the through Buffalo-New York traffic, the long haul trade, yet the average miles per day made by government barges was but 24.4 miles as against the 25.7 miles per day

made by independent boats. The average time per trip by government boats was 14.1 days, as against 7.9 made by the independent boats. One independent carrier having in service power units and cargo barges of the old canal type with a season capacity of about 120,000 tons carried during the year over 90,000 tons or 75 per cent of its capacity. Government barges carried less than 30 per cent of their capacity. Shippers have reported to the Department that government barges were as long as 75 days in transit from New York to Buffalo. Government barges with cargo valued at hundreds of thousands of dollars on which the shipper was paying interest charges laid at the Barge canal terminal in the city of Albany for several weeks. A time was reached when shippers of flaxseed from New York dissatisfied with the abominable service of the War Department line diverted their tonnage to the independent operators. Immediately the government decreased its rate on this commodity. The former rate was fair and reasonable. It is questionable whether the decreased rate was remunerative. The loss in earnings to one carrier resulting from the destructive competitive methods of the government would have been sufficient to pay a substantial dividend on the entire capital stock of the company.

"Not the least of the evils of government operations were in their effect on the commercial interests of the canal. The utter incompetency and rank carelessness of government employees manning the barges placed the canal structures in constant jeopardy. The movement of a government fleet was a serious menace to locks, dams and bridges. Navigating the waterway with complete disregard of rules and regulations the government boats wrought havoc with the channel buoy lights; badly damaged locks time and again; were in collision frequently with other craft; were sunk here and there in the canal channel, and in one instance almost completely demolished a bridge. Reports continually reached the Department that officers and crews on government boats were intoxicated while on duty and incapable of safely performing their duties. A rehearsal of the accidents and damage caused by the incompetent and careless handling of government barges would entail more space than may be permitted in this report. Suffice it to say that had the conditions cited resulted from the operation of barges by a private company the privileges of the waterway would have been denied that company. As it was, the impression prevailed that since the War Department's Canal service was conducted through Act

of Congress, the operation of the boats was outside the jurisdiction of the Superintendent of Public Works.

"Government operation on the New York canals in 1918 and 1919, under the Railroad Administration, was most deficient. Government operation under the War Department in 1920 was so replete with mismanagement, inefficiency and incompetency as to defy imagination. The fiasco of government operations in 1918, 1919 and 1920 demand that there be brought about an immediate termination of Federal operations on the New York State waterways. The people of New York have been compelled to assume a large share, nearly 30 per cent, of the million or more dollars lost by the Railroad Administration and the War Department in their ridiculous attempt to conduct a business enterprise. The commercial interests of the State demand that the government withdraw from business on the New York canals and cease competing with citizens of the State in a field where the government has no moral right to continue. To that end, I urge upon my successor and your Honorable Body the imperative necessity of early and forceful action that there may be introduced and passed in Congress legislation amendatory to the Railroad bill that will compel the immediate discontinuance of government operations on the Barge canal."

Federal control of the Barge canal was stopped in time to free the 1921 navigation season from boats operated by the Government. But Superintendent Cadle said in his report for the year that only through the most vigorous efforts of the Governor, the Legislature and State officials was this brought about. The Government boats were purchased and operated on the canal by a private transportation company.

CHAPTER XVI

A STATE CANAL TRAFFIC BUREAU

Bureau Recommended by Commission on Operation — Recommended by State Engineer — Character of Efficient Bureau — Bureau Authorized — Bureau Established — Activities of Bureau — Extension Recommended — Need of Further Activity.

IN OUR review of what was accomplished by the Commission on Barge Canal Operation we said that in recommending the creation of a traffic organization for the new waterway the commission was trying to cure one of the most pernicious ills of the whole canal system. Just why the State was so long in diagnosing this malady is hard to understand. No railroad, as the commission pointed out, could hope to succeed under the methods, or rather the almost utter lack of method, employed by the State. At last, however, the State did come to realize its condition and attempted to provide a remedy, but whether an adequate remedy without further action is still to be seen.

In creating the office of canal traffic agent the State made provision for undertaking a most difficult task. But how difficult and also how important that task really was we doubt whether the public at large or indeed many individuals have any sufficient appreciation. Perhaps we can get a partial conception of both its need and its immensity by listening to something the general manager of the Manchester ship canal said concerning that oft-cited waterway. We quote this remark in full elsewhere, but a brief paraphrase will suffice here. He said that, strenuous and exhausting as was the struggle to carry the authorizing bill through Parliament and great as was the engineering feat, these were as nothing to the tremendous task of diverting traffic from beaten tracks to the new route and only through organization and the employment of trained experts was this done.

There was no immediate response to the Operation Commission's recommendation. That which brought about the necessary legislation was doubtless a recommendation from the State Engineer, which was endorsed by the State Waterways Association and followed by a proposal by the Superintendent of Public Works to appoint a temporary traffic agent and a recommendation that such office be made

permanent. These suggestions, reinforced by active support of proposed legislation, secured the desired end.

Let us look for a moment at the State Engineer's recommendation. It was contained in his annual report for 1915, presented to the 1916 Legislature. Mr. Williams said, "Should a railroad be constructed at an expense of \$150,000,000 and its officials assume the policy of waiting for business to come to them, the stockholders might well complain. On the completion of the Barge canal and its terminals the people of New York State will have invested this amount in improving the canal system and to realize to the full extent on this investment, I earnestly recommend the establishment of a bureau corresponding to that of the general freight agent of one of our large railroads, which would furnish shippers information relative to water-borne transportation, and, to go still farther, would endeavor to encourage shipments whereby the canals might be used to their full capacity, thus insuring the people of this State a handsome return on the investment made."

A few months later in amplification of this suggestion the *Barge Canal Bulletin*, a monthly publication issued under the direction of the State Engineer, had the following to say in regard to what should be the character of the bureau recommended, which it denominated a State Traffic Bureau:

"As to the nature of the bureau, it may be compared to the general freight agent and the freight-soliciting bureau of a railroad. It would be nearly what these railroad departments are, but it would be something more. One of its chief functions may be described as educational and another as developmental, or assistful. It could not confine its duties to the narrow limits of a freight solicitor nor conduct its solicitations along the lines of a partisan railroad official. As a State organization it would have to be entirely free from partiality toward any one of the boat lines doing business on the canals.

"The primary duty of a State traffic bureau, like that of any traffic bureau, would be the giving of information concerning rates, routes, connections, distances, times of sailing, comparisons between water and rail costs and other allied topics. However, if a State traffic bureau is to fulfill its whole mission this will not be its chief duty.

"That the State and its citizens may derive to the full the benefit inherent in the improved waterways, the people who send and receive freight must have brought to their attention the advantages of water-

borne traffic. While this work is educational, it cannot be done at arm's length by the circular method. Someone who knows facts and conditions must come into personal touch with these people. That such a one will get a ready hearing from the transportation superintendents of large concerns and the managers of smaller firms, no one who knows the situation can doubt. The inadequacy of existing transportation systems and the congestion and delays, especially during the past six months, clearly point to the need and opportune advent of the new State waterways.

"Probably the chief beneficial service of the proposed traffic bureau, although its assistance may be soonest forgotten, will be its work of development. By knowing thoroughly the products and markets, not only of New York state, but of a wide adjacent region, the producer and manufacturer may be helped to extend and increase his trade and get his raw materials cheaper, and the consumer may learn how he can secure better goods for the same price he has been paying or the same goods at less cost.

"In a word, a State traffic bureau, to attain its high office, should be what any government bureau would naturally be supposed to be — an organization for benefiting the citizens of the state by assisting them within the particular field of its activity."

Again in his 1916 report, which was transmitted to the Legislature early in 1917, the State Engineer repeated his recommendation. It was about the same time that the Superintendent of Public Works suggested the new employee in his department, to be known as a canal traffic agent. Several chambers of commerce throughout the state endorsed these recommendations and the Legislature answered by passing an act (chapter 26) which added section 49 to the Canal Law and authorized the Superintendent to appoint a canal traffic agent "to collect and tabulate information and data relative to canal transportation, transportation of freight to and from localities which are feeders to the canal system, and rates and transportation costs to and from points beyond the limits of the canal system, by water and by railroad, when a portion of the route may be by canal." These data were to be so arranged as to be available to the public and also the publication of pamphlets for disseminating canal information, was authorized by the new law.

By July, 1917, the Superintendent had established a canal traffic bureau in his department and the work of compiling statistics and conducting an extended campaign of education had begun. In reporting to the Legislature on the founding of the bureau he said

that it must be borne in mind that in this campaign the prejudices to be removed were of long standing and that the present generation of business men had grown up with no knowledge of the possibilities of transporting freight by water, since waterways had ceased to be a factor for more than a decade and their use had come to have no place in the business plans of these men.

During the first year's activities of this bureau efforts were confined largely to the development of intrastate traffic, since the number of boats in service was very limited and joint rates and joint routes between rail and water lines were still to be adjusted. It was in 1917, as we shall see a little later, that the Public Service Commission was given authority over railroad and canal relationships. Pending the establishment of such coöperative rates and routes, it was thought futile to attempt to interest shippers in territory outside the state, inasmuch as the existing rates were prohibitive in comparison with all-rail rates. But considerable educational work by means of canal literature was carried on in these outside fields.

For extending the service of the bureau the Superintendent planned to have each harbormaster add to his terminal duties those of local freight agent and solicitor. Not only would they furnish information to the shippers in their respective localities concerning tariffs, routes and means of utilizing the canal, but they would be in intimate touch with the local situations and would report their findings to the Superintendent, being able to secure accurate data relative to the source of raw materials used by local manufacturers, the points to which the finished products were shipped, the character of service shippers required, the rates necessary to attract commerce, the building of new factories in their several communities and the industrial conditions generally.

Not much time has passed since the establishment of this bureau, but already considerable has been accomplished. The vast field still to be covered, however, is appreciated by those in charge of the work. As the Superintendent said in a recent annual report, "The task of reaching all of the many thousands who might advantageously ship their products by the canals is a large one and years of constant effort would be required before the merits of the 'Ship by Canal' campaign could be brought home to the majority."

It is along the lines of publicity and education that efforts are chiefly being directed. Conferences and meetings have been held with shippers and commercial organizations, not only those of the important cities and villages in New York state but of the Middle

West and New England as well. Large numbers of shipping representatives, industrial traffic managers, sales managers and others have been afforded an opportunity personally to inspect the canal in operation and get a first-hand knowledge of the conditions of navigation and the excellence of the terminal facilities. In this way prejudices against canal transportation, conceived largely through ignorance of true conditions, have been removed. As a means of reaching a much wider audience, the many who cannot be taken on an actual trip over the canal, there has been prepared a motion picture film which shows some of the prominent structural features of the waterway, the carrying of cargoes upon it and the handling of freight at its terminals.

To illustrate how even less important details are not neglected in the attempt to bring canal facilities to the attention of the public, it may be said that advantage has been taken of the immense amount of travel on the railways and highways paralleling the canal and large illuminated sign-boards have been erected at vantage-points, bearing matter briefly descriptive of the adjacent structure or channel and also pertinent canal propaganda. A somewhat similar medium of advertising has been a sign-board on boats, telling how many carloads of a given commodity a boat was carrying or such other appropriate words as would tend to arouse interest in the canal. Another form of sign-board has recently been placed rather generously along the highways even to a considerable distance from the canal, pointing the direction to the nearest terminal.

Were it not for the sadly inadequate supply of canal boats, the traffic bureau might have widely broadened its campaign of solicitation, doubtless with considerable success. The bureau has accepted as one of its duties the remedying of this defect. Whenever opportunity has offered, prospective transportation companies have been given all available assistance, in an endeavor to encourage the placing of more boats in canal service. As an instance of this policy there may be cited a pamphlet entitled, "Principal Requisites of Canal Carriers and the Potential Canal Tonnage," issued by the Superintendent in February, 1918.

One may get a comprehensive view of the work done by this bureau from a paragraph in the Superintendent's report for 1920. He summarized as follows:

"The activities of the Traffic Bureau are showing results. Constant solicitation has been carried on; shippers everywhere have been aided and encouraged to utilize the canal route; transportation

organizations have been fostered and assisted in acquiring cargo; rates have been initiated, routes developed, obsolete practices eliminated; new methods inaugurated; unfounded prejudices overcome, literature descriptive of the canal facilities prepared and distributed throughout the country; articles showing the value of the waterway and how it may be utilized furnished the press and periodicals; the interests of the waterway generally safeguarded, inimical legislation opposed, boats acquired for shippers; cargo obtained for boats and every effort made to rehabilitate commerce on the canals. That such efforts have been fruitful is to be seen in the increasing commerce of the waterways and the very apparent reawakening of interest among shippers in canal transportation."

The Superintendent went on to say that much more can be accomplished with a larger traffic organization and he recommended that it be extended by renaming the head of the bureau, calling him Traffic Director rather than Canal Traffic Agent, and giving him three principal assistants, one to be located at Buffalo, one at Syracuse and the other at New York city. Such, it is said, was the plan originally conceived and advocated by the shipping interests of the state, and these interests are urging that the time has come for expanding the bureau to this extent, since, if canal commerce is to grow, this organization must keep ahead of it.

We said that it remained to be seen whether the State had provided an adequate remedy for removing the prejudice against the canal and for educating the shipping public to an appreciation of the advantage of using the new waterway. The traffic bureau has accomplished much, probably all that could be expected, and we would not in the least degree disparage anything it has done, but when we learn, as we did recently, with what surprise the Congressmen from the Middle West found a well-equipped, modern canal instead of the shallow, inefficient channel they had expected, and when we see too how ignorant of the new traffic opportunities are the people of our own commonwealth, we wonder whether the State did not make an almost fatal error in waiting too long to begin its campaign of advertising and solicitation and also whether much more vigorous efforts will not be needed before converts to the ship-by-canal idea are added in sufficient numbers and the new waterway comes into its own.

CHAPTER XVII

REGULATING CANAL AND RAILROAD RELATIONSHIPS

Regulation Recommended by State Commissions—Importance of Rail and Water Coöperation—Renew of Question—Hostile Attitude of Railroads, Both Domestic and Foreign—Studies in America and Europe to Find Remedy—Panama Canal Act—Status of Law in New York State—Characteristics of Effective Law—Same Relations Needed between Canal and Railroad as between Separate Railroads—Action by New York Necessary—Attempted Legislation—Regulating Law Passed—Analysis of Law—Rail Connections at Canal Terminals—Delay in Invoking Law.

IN OUR discussion of the terminal question and again in our consideration of the work of the Commission on Barge Canal Operation we have seen something of the need of amicable and cooperative relationships between railways and canals. The lack of such relationships had been recognized by canal men as one of the chief reasons why waterway shipping had been on the decline, but it remained for the Terminal Commission and the Commission on Operation to give authoritative public voice to the demand for a change. Indeed until the investigations of these commissions and of two nearly contemporaneous national commissions there had been no large general appreciation of how completely the railways had dominated the canal situation by their hostile actions. Finally New York State enacted a measure calculated to remedy the evil. This was in 1917 and it was brought about only after several years of hard work by canal advocates.

It will be recalled that the Terminal Commission in its final report in 1911 had recommended that "a commission composed of representatives of the leading commercial organizations in different parts of the state should investigate conditions affecting interchange of freight, the subject of prorating and through-rating, the recognition of through bills of lading and of through-rates at points of interchange, as between water and rail carriers." The answer to this recommendation, it will also be remembered, was the Commission on Barge Canal Operation, the question of rail and canal relationships being one of its main subjects of investigation. This latter commission reported to the Legislature of 1913 and made recom-

mendations for certain enactments which in general were embodied in the law of 1917. The State, however, was not entering an unexplored field in this legislation. The National government by its Interstate Commerce Act and its Panama Canal Act had led the way and New York's law was based on the Congressional acts and the Federal experience.

In reviewing the work of the two State commissions we did not discuss the subject of rail and water relationships very fully, leaving it rather for the present occasion. But a little investigation will show how important a subject it is, how, like the terminal question, it lies at the very foundation of canal success, the lack of connections and cooperative relationships with railways being sure to render ineffectual and almost useless any canal, however complete and splendidly equipped in all else that canal may be. We may see how the railroads, by operating their own boat lines and by refusing to interchange, to prorate and to through-rate freight and to recognize through bills of lading, have been able to minimize or even entirely to eliminate waterway competition. At least such is the claim of canal advocates and there seems to be abundant evidence to substantiate their assertions.

Even before the Commission on Operation had made its recommendations to the Legislature canal men were alive to their peril and had taken action which resulted in introducing two bills during the same session, aimed at the joint regulation of rail and canal rates. This action was taken by the State Waterways Association at its annual convention on September 20, 1912. Its immediate cause was a paper before the convention on "The Needs of Legislation as to the Relations between Rail and Water Carriers," by William J. Roche of Troy.

If we are to understand the situation that confronted the State and know why it eventually took the action it did, we must of necessity review the history of railroad competition with waterways and also learn what had been said on the whole subject by men who spoke with the authority of intimate acquaintance with the facts. Such a comprehensive grasp of the case Mr. Roche's paper gives us. It is made up largely of quotations from these men who spoke with authority and in addition it tells what the United States had done and what the status was in New York state. We can do no better than to avail ourselves of the compilation thus made and quote from the paper at some length.

"The Panama Canal Act and the discussions attendant upon its passage through Congress," said Mr. Roche, "have again sharply drawn attention to the relations between carriers by rail and carriers by water, and to the necessity of adopting and enforcing definite public policies concerning the two classes of carriers. . . .

"The questions have been asked: Should railroad corporations be allowed to operate boat lines? Are the State and the nation engaged in developing waterways only to have these waterways become mere adjuncts to the railroad systems? In view of the large appropriations which are being made, are we rearing and fattening waterway lambs for railroad consumption? What statutory measures are required to ensure fair treatment of the water carrier by rail carrier and the efficiency of the public waters as agencies of commerce?

"The history of transportation both in Europe and in this country tells us of the dangers of permitting the unrestricted use of waterways by railroad corporations. The past points a warning finger to the future. Railroads acquired water lines, not to put them to use for transportation purposes, but to put them out of use, and thus eliminate competition and establish monopoly. They laid hands on the choicest sites in harbors and along lakes and rivers for freight stations. They refused to issue through bills of lading when part of the route was over a water line. They cut rates on the boat lines which they controlled until their competitors sold out or were starved out. They declined to make joint rates and to prorate with water carriers. Physical connections between the railroad stations and docks where vessels received and discharged their cargoes were denied. Discriminations of various kinds, including rebating, were practiced. The result was a tremendous decline and, in some cases, the extinction of water-borne commerce. The Board of United States Engineers for Rivers and Harbors, expressing their views as to the cause of the decline of water transportation, say:

"The prevalent cause leading to the decline of water transportation is without doubt the railroad. The railroad corporation of large resources and facilities for its business successfully competes with navigation companies or individual boats with limited resources and facilities; and, competing, naturally does not enter into such relations with its competitor as to increase the business of the latter, declining to prorate, or to recognize through bills of lading. Moreover, railroads have established rival boat or barge lines through which competition has been discouraged."

"The New York Barge Canal Terminal Commission state in their report of 1911:

"The attitude toward the water carriers that has long obtained by the railroads has been one of pronounced hostility. Through transportation, that is to say, the carriage of freight originating outside of the State, has almost reached the vanishing point."

"Mr. Allen stated at the 1909 Convention of the Rivers and Harbors Congress in referring to the Mississippi River.

"Again the railroads have paralleled the river, have reduced the rates of carriage until it is impossible for boats to make a reasonable interest on their investment, and when they have gone out of business their rates have been restored or increased and railroads thus have monopolized traffic."

"At the same Convention, United States Senator Burton of Ohio said, referring to the advantages enjoyed by railroads:

"Then there is a second class of advantages that are arbitrary, due to their lowering of rates to drive waterways out of business. The best illustration with reference to that which I know, is a case where a barge line on the Mississippi was carrying freight at 25c. a hundred very profitably. The railways put down the rate to 10c. a hundred until the barge line was driven out of business; then the railroads put up the rate to 50c. a hundred, where it has remained ever since. Now, that ought not to be allowed; legislation ought to prevent anything of that kind. . . . Gentlemen, it is hardly reasonable to spend \$3,000,00 on a waterway that will not be useful, except to make a million-dollar railroad behave itself. There ought to be, in the armory of the law, something more potent, more ready than that. . . . What does the fact that railroads buy out competing water lines prove? It proves that they can afford to buy in order to get rid of a competitor. Why? Because that method of transportation is cheaper than their method of transportation."

"At the Convention of the National Rivers and Harbors Congress in 1911, Mr. Wilkinson stated:

"On the introduction of the railways, Germany passed through an experience corresponding to ours. For a long period the waterways lost their importance as a factor in the development of the commerce of the country. The Germans thought, as we have thought, that when the railways came in they could afford to neglect their waterways. In the meantime the railways secured control of the canals, harbors, and waterfronts, and either closed up waterborne traffic or raised the tariff rates for water carriage to force

transportation by rail until the cost of raw materials became so prohibitive that factories were forced to close down, throwing people out of employment, and great distress prevailed.'

"It is well known that in England, which in the earlier days was intersected by many canals, inland water transportation is in a backward condition, because the railroads acquired control of the waterways, and that acts of Parliament intended to change the situation, have had but little effect because they came too late.

"Commissioner Herbert Knox Smith says, regarding the attitude of the railroads towards water carriers:

" 'Probably the greatest single deterrent to water-terminal advance is the present adverse attitude of rail lines toward independent water traffic, in their exclusive control of frontage, in refusal or neglect to co-ordinate with general water traffic, and in refusal to prorate generally with water lines in through movement of traffic. Until this underlying relation of rail to water systems is adjusted on some common sense basis of harmony, there is little hope of great advance in water terminal conditions.'

"United States Senator Bristow declared with reference to the Pacific Mail lines that they have been 'commercial pirates' run wholly in the interest of the transcontinental railroads for the purpose of using the Panama Canal in private commerce and to destroy any steamship lines that wished to establish legitimate competition with these railroads by the Isthmian route; that an absolute prohibition of the use of the canal to steamship lines, the stock of which or any part of which is owned or controlled directly or indirectly, by railroads doing a transcontinental business is necessary, and that if such a provision should not be incorporated in the bill, the canal would be of little benefit to the American people and American commerce.

"The Directors of the San Francisco Chamber of Commerce pithily said:

" 'A railroad cannot honestly compete with itself, whether by means of box cars or ships.'

"The testimony on the subject is abundant and comes from authentic sources both foreign and domestic. In this country, complaints of the practices of railroad corporations in their efforts to eliminate waterway competition, have been numerous and their extent continental. There can be no better guide to the future than the lessons taught by the past, particularly when the teaching is general and prolonged. Coincident, therefore, with the commencement of

a new era of waterway development and with the expenditure of vast sums of public money for that purpose, men's minds have naturally turned to the discussion and formulation of policies that would result in securing an adequate return for the moneys thus expended, that would prevent a monopoly of transportation, that would insure the advantages of waterway competition in the movement of the products of the field, the forest, the mine and the factory and that would aid in the upbuilding of the industries of the nation.

"A review of the methods intended to accomplish these ends is pertinent.

"In his message to Congress in December, 1910, President Taft said, concerning the Panama Canal:

" 'I cannot close the reference to the canal without suggesting as a wise amendment to the Interstate Commerce Law, a provision prohibiting interstate commerce railroads from owning or controlling ships engaged in the trade through the Panama Canal. I believe such a provision may be needed to save to the people of the United States the conflicts of the competition in trade between the eastern and western seaboards which this canal was constructed to secure.'

"Commissioner Prouty of the Interstate Commerce Commission declares:

" 'If the waterways of this country are to be of substantial benefit in the way of reducing rates of transportation, it is absolutely essential that rail carriers be prohibited from owning or controlling, directly or indirectly, competing water carriers.'

"Dr. Crowl, Associate Editor of the Wall Street Journal, writes:

" 'Investors are not going to put capital into a waterway enterprise from which railway competition can drive the investor in the course of a few years. Hence, protection by law must be given against unfair competition.'

"The New York Barge Canal Terminal Commission state:

" 'Upon the Continent of Europe it should be said the railroads are either owned by the Governments outright, or they are in part so owned. The supervision of the railroads and the regulations imposed upon them by the general Government are designed to and have the effect of permitting the freest possible development of the waterways and this largely accounts for the splendid progress made in waterway and harbor improvements and in the growing commerce so notable everywhere.'

"The National Waterways Commission made an exhaustive investigation of questions relating to water transportation both in

this country and in Europe, and in their report recently presented to Congress, they say:

“ ‘ The lack of adequate regulations makes it possible for the railways to effectually control or to crush out water competition through their ownership and control of boat lines. It is a well-known fact that the trunk-line railways, through their control over terminals at Buffalo and their ownership of steamship companies on the Great Lakes, have been able to dominate the lake and rail package freight business between New York and Chicago and also to a considerable extent the grain traffic. On the business thus controlled the water rates have risen, while on the coal, iron and grain traffic not controlled by the railways the water rates have steadily declined. In like manner the New York, New Haven & Hartford Railroad practically dominates water transportation on Long Island Sound by reason of its ownership of the New England Navigation Company. Independent companies have been unable to compete successfully, owing to the advantage which their railway-owned competitor enjoys. The steamship companies plying between the North Atlantic and Southern ports in the coastwise trade are likewise working in harmony with the connecting and competing railways by which they are owned or controlled, so that little, if any, active competition exists. Also on some rivers the railways have acquired control of packet lines.

“ ‘ While this rapidly increasing control of railways over water lines tends to bring about that harmony and co-operation between them which is necessary for the development of transfer traffic, it also has possibilities of harmful results which require regulation. Where the railways grant prorating arrangements to boat lines which they own or control, while denying the same privilege to competing independent lines, the latter are practically precluded from securing any transfer traffic, while on the local or port-to-port business they must meet the competition of the railway-owned boat lines, which are at liberty on this business to cut rates to any extent they choose. Under such conditions it is very difficult for independent lines to succeed, and the cases are numerous where they have been forced to retire from the field. . . .

“ ‘ Sedulous care is taken by most European countries for the protection of inland water-borne traffic against railroad competition. In France this is accomplished by enforcing a differential of 20 per cent. in favor of the waterways as against railways, with the evident intention of maintaining both methods of transportation. In a

majority of the other countries in which water transportation has reached its highest development, the railroads wholly or partially belong to the State. This is true in Germany, Austria, Hungary, Holland and Belgium. The well-established policy in these countries is to secure co-operation between railways and waterways by official control of railway rates with a view to maintaining profitable traffic on the latter.'

"In an appendix to the report, I find:

"It may prove cheaper for a railway to control water carriers than to compete against them, especially when the natural advantages of the former are great. Thus it was the policy of railroads at one time to purchase outright or secure a controlling interest in competing canal companies. The common method in the United States now is for the railways to own or control boat lines. Where they also own the terminal facilities at a port it is a very easy matter to prevent serious competition from independents. The view was once held that the waterways were free highways on which competition would always exist, but what has transpired in the United States during the last decade indicates that even water transportation may be monopolized or so effectively controlled that it is hazardous for independent boat lines to enter the field.'

"The experience of all countries has been that as long as the railways were not subject to strict control, they have succeeded in crushing out or controlling water competition. The regulation of railway activities for the protection of water carriers has, accordingly, been found necessary in all countries before the normal development of water transportation could take place.'

"Guided by such experiences and recommendations, and to make certain that one of the great waterways of the world, connecting the two principal ocean highways, would be an efficient medium of commerce, free from the control of the other great force in the transportation world, Congress inserted the following provision in the Panama Canal Act, which was approved August 24, 1912, to wit:

"From and after the first day of July, nineteen hundred and fourteen, it shall be unlawful for any railroad company or other common carrier subject to the act to regulate commerce to own, lease, operate, control, or have any interest whatsoever (by stock ownership or otherwise, either directly, indirectly, through any holding company, or by stockholders or directors in common, or in any other manner) in any common carrier by water operated through the

Panama Canal or elsewhere with which said railroad or other carrier aforesaid does or may compete for traffic or any vessel carrying freight or passengers upon said water route or elsewhere with which said railroad or other carrier aforesaid does or may compete for traffic; and in case of the violation of this provision each day in which such violation continues shall be deemed a separate offense.'

"The act also confers upon the Interstate Commerce Commission jurisdiction to determine questions of fact as to the competition or possibility of competition, after full hearing, on the application of any railroad company or other carrier and that application may be filed for the purpose of determining whether any existing service is in violation of the section and for an order permitting the continuance of any vessels or barges already in operation. . . .

"Of course this statute relates only to interstate commerce. It does not affect the commerce which originates and terminates within the State itself, and which in a State like New York is vast in extent. Many persons are not aware of the fact that the bulk of the tonnage carried upon the Erie and Champlain Canals is intrastate. There is also the commerce of very large proportions on the Hudson River between the numerous cities along its banks, between New York and Troy. The same is true in many other States. This makes it of the highest importance that State Legislatures shall promptly proceed to declare policies and enact legislation which shall be in substantial harmony with this act of Congress; otherwise an embarrassing divergency of policies and practices will ensue.

"The Transportation Corporations Law of this State provides for the formation of navigation corporations which may operate vessels upon the seas, sounds, lakes, rivers, canals or other waters. That law contains this provision:

"'No railroad corporation shall have, own or hold any stock in any such corporation'—meaning in any navigation corporation.

"Daniel O'Connell, the Irish lawyer and orator, boasted that he could drive a coach and four through an act of Parliament. Similarly, it will be readily seen that this statute can be made utterly ineffective. The railroad corporation need not hold the stock of the navigation company, in its own name, if it desired to control the latter. Many devices could be resorted to, in order to obtain such control. There is the familiar medium of the holding company. . . . For the purpose therefore, of making the statute effective and of keeping the waterways free from railroad control, I prepared an amendment to the existing law, and had the same introduced in

the sessions of the Legislature in 1911 and 1912; but there was no hearing on the bill. . . .

"Congress has proceeded step by step to regulate railroad traffic and extend the powers of the Interstate Commerce Commission. In 1906 authority was given to the Commission to establish through routes and joint rates as the maximum to be charged, and to prescribe the division of such rates and the terms and conditions under which through routes should be operated, and it was declared that 'this provision shall apply when one of the connecting carriers is a water-line.' In 1910, Congress undertook to check an abuse by providing that whenever a rail carrier shall, in competition with a water route, reduce the rates on the carriage of freight to or from competitive points, it shall not be permitted to increase such rates, unless after hearing by the Interstate Commerce Commission it should be found that the proposed increase arose upon changed conditions other than the elimination of water competition.

"It was seen, however, that the foregoing and like provisions would not, of themselves, sufficiently stimulate and protect water-borne traffic. Other things had to be enacted to bring about that co-ordination of water and rail lines which is essential to the development of cheap, rapid and adequate transportation. Congress undertook to provide for some of these in the Panama Canal Act as follows:

"When property may be or is transported from point to point in the United States by rail and water, through the Panama Canal or otherwise, (but not entirely within the limits of a single State) the Interstate Commerce Commission is given jurisdiction of such transportation and of the carriers, both by rail and water, (a) to establish physical connection between the lines of the rail carrier and the dock of the water carrier by directing the rail carrier to make suitable connection between the two or by directing both to co-operate in this respect, wherever such connection is reasonably practicable and the amount of business to be handled is sufficient to justify the outlay; (b) to establish through routes and maximum joint rates between and over such rail and water lines and to determine the terms and conditions under which such lines shall be operated in the handling of the traffic; (c) to establish maximum proportional rates by rail to and from the ports to which the traffic is brought or from which it is taken by the water carrier and to determine to what traffic and in connection with what vessels and upon what terms and conditions such rates shall apply.

"These are further distinct steps intended to encourage and protect transportation by water routes. Heretofore the relations, or rather the absence of relations and co-operation between the rail and water carriers have greatly tended to restrict the selection by the shipper of the route upon which he desired to send his goods and to force him to bill them by an all-rail route. They operated to retard the rapid movement of merchandise and generally to inconvenience merchants and manufacturers. The policy that prevailed was the reverse of that which was in force as to railroad lines.

"Under State law, railroad corporations are required to make physical connections with the railroads of other corporations and to afford to competing roads equal terms of accommodation and privileges in the transportation of cars, passengers, baggage and freight, and equal facilities in the interchange and use of cars; and the Public Service Commission has power to establish through routes and joint rates for the transportation of property upon railroads and to declare the portion of such rates to which each common carrier shall be entitled and the manner in which the same shall be paid and secured. All this is demanded in the public interest. The law should require as much as this from the railroads, which derive their charter from the sovereign power, in favor of the waterways built and maintained by the public moneys, and of the shippers who desire to make use of these waterways.

"Provisions of the kind noted, as well as one requiring the issuing of through bills of lading of merchandise shipped over both rail and water lines, should be placed in the Public Service Commission Law of this State. At the present time the Public Service Commissions have no jurisdiction or supervision over common carriers by water. This was decided by the Commission of the Second District in the case of Murray's Line against the Delaware & Hudson Company. It was also decided in that case, that the fact that a railroad company charged a shipper partly by water and partly by rail, more for transporting property between two points on the railroad than it charged for the same service when the property transported was received from a connecting railroad and carried under a joint tariff arranged by the two railroad companies, did not establish a charge of undue preference or discrimination under the law of the State. Of course the inevitable effect of such a ruling and such a condition of law is to deprive waterways of their natural advantages and to discourage transportation by such routes. . . .

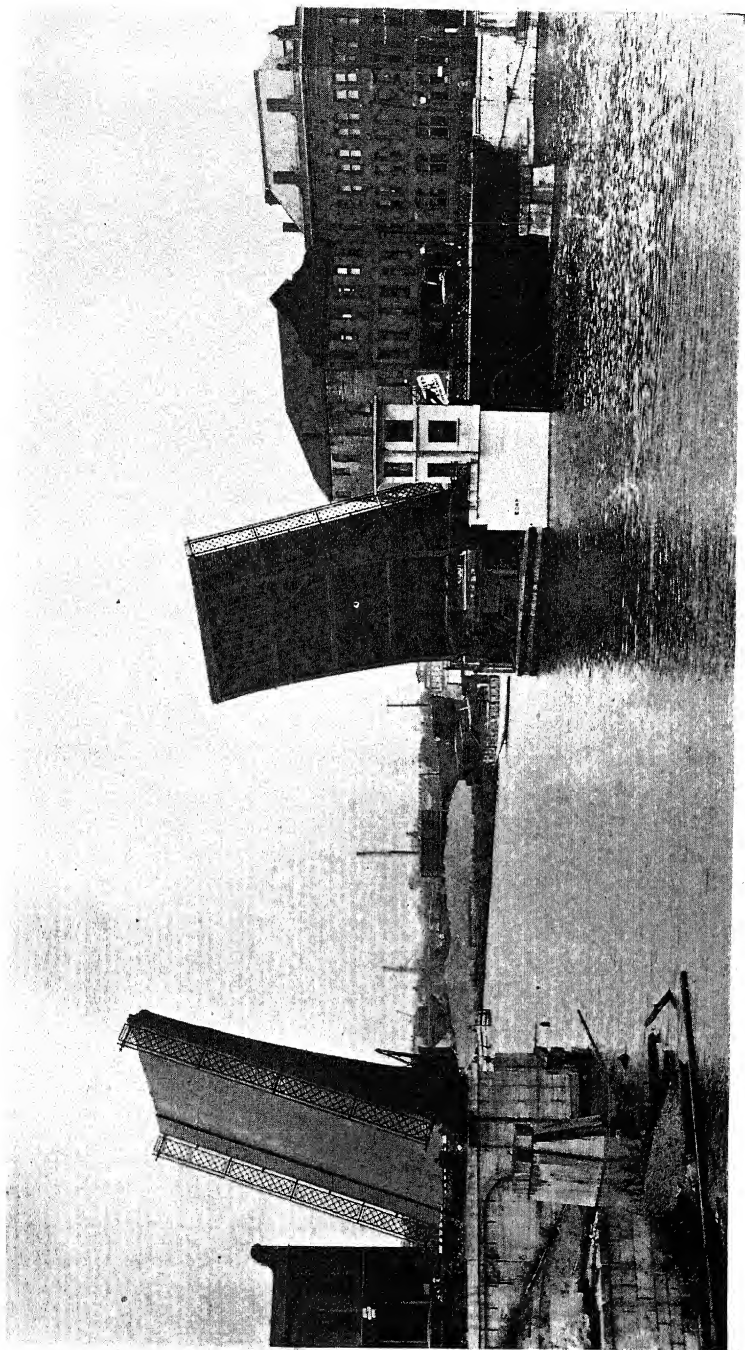
"The argument is advanced that the railroads should be allowed the same use of the waterways as other corporations or as individuals, and that if abuses should develop by reason of such use, correction could be made by State or national commissions having authority in the premises. It is an old saying that 'an ounce of prevention is better than a pound of cure.' A statute which prevents an objectionable condition from arising, is much better than a state of law under which the condition may arise and then undertakes to provide a remedy for correcting the abuses which have grown up. Haling railroad corporations before Public Service Commissions is a lawsuit; it is a slow and expensive process. Many individuals would rather suffer wrongs than enter upon litigation. The true remedy, therefore, is not regulation but is exclusion.

. . .

"We know the things that have militated against transportation by waterways; it is time to move in the direction of preventing their continuance. Congress has set the pace; the State of New York should take it up. No commonwealth is more deeply concerned than the Empire State. The State has a right to limit the powers and activities of the corporations which derive their very life from the laws of the State and to regulate their relations with other corporations and with individuals carrying on business that is affected with a public interest. . . .

"Every consideration demands that one agency alone shall not be allowed to have anything approaching a monopoly of the transportation of persons and property. The merchant and manufacturer who choose to ship partly by rail and partly by water should be given the same advantages that are accorded to them when they ship their goods by connecting lines of railway. There is a splendid future before the State of New York in commercial and industrial activities, if we solve our transportation problems upon right lines. Bitter will be the disappointment of the people in waterways as economic factors, unless legislation is enacted that will keep off the overshadowing hand of the railroad and permit of the freest development of these highways."

The action of the State Waterways Association at its convention in 1912 was to appoint a committee on legislation and direct it to prepare suitable bills and endeavor to have them enacted into law. This committee consisted of Mr. Roche, chairman, George Clinton and Henry W. Hill of Buffalo, Lewis Nixon and Frank S. Gardner of New York and John D. Kernan of Utica.



Bascule bridge at Tonawanda, giving unlimited headroom. For the development of traffic on certain portions of the canal, notably at the western end, bascule bridges were permitted by amended law.

The committee drafted two bills and had them introduced in the Legislature. The purpose of one was to make effective the Transportation Corporations Law, which, although it prohibited railroad corporations from owning stock in any navigation company, was openly or covertly violated. This bill was taken almost word for word from the Panama Canal Act. The other bill brought navigation companies and water lines under the jurisdiction of the Public Service Commission. Under the existing law they were not so included.

No hearing was given on the Senate bills and it seemed impossible for the Waterways committee to secure one. A hearing was held by the Assembly Judiciary Committee, at which the bills were opposed by attorneys for two large railroad systems. Both measures seem to have died in the reference committees. That influences powerful enough to kill them were set in motion is the belief of their sponsors. This was not an opportune session, however, for any unusual legislation. It was at this time that Governor Sulzer and the Legislature were embroiled in what proved to be mortal political combat.

During each legislative session thereafter similar bills were introduced and strenuous attempts were made by the Waterways committee to have them passed. In 1917 they achieved their end. Chapter 805 of the laws of that year was entitled "An act to amend the Public Service Commission Law in relation to common carriers by water." An analysis of this act shows that it contains ten main items. Divested of some of their legal verbiage the new provisions of the law are as follows:

After adding carriers by water to the list of common carriers subject to the supervision of the Public Service Commission, the act makes it unlawful for any common carrier to charge any greater compensation in the aggregate for transportation for a shorter than for a longer distance over the same route in the same direction, the shorter being included within the longer distance, or to charge any greater compensation as a through rate than the aggregate of the intermediate rates.

Whenever a rail carrier in competition with a water route reduces rates to competitive points, the rail carrier is not permitted to increase these rates until it has proved to the Public Service Commission that the proposed increase rests on changed conditions other than the elimination of water competition.

In all instances where competing lines of railroads or carriers by water constitute portions of a through route, the shipper shall have the right to determine over which of the competing lines his freight shall be transported. The law gives the shipper the privilege of designating over which of two or more competing routes, either rail or water, his goods shall go and makes it the duty of the initial carrier to route the shipment and issue a through bill of lading as directed by the shipper and also to transport the goods over its own line and deliver them to the connecting carrier in accordance with these instructions. It makes it incumbent also on each carrier in turn to transport and deliver the shipment as directed in the bill of lading.

The Public Service Commission has power to order carriers by rail and carriers by water to establish through routes and joint rates, and in case the companies fail to do this the Commission is to establish reasonable rates and fix the portion each carrier is to receive.

The Commission has power to establish physical connection between the lines of the rail carrier and the dock of the water carrier by directing the rail carrier to make connection with a track built from the dock, or by directing either or both carriers to make suitable connection, provided this connection is reasonably practicable and justified by the amount of business. The Commission has full authority also to determine the terms and conditions upon which these connecting tracks shall be operated and what sum shall be paid to or by either carrier, even in cases where the dock is owned by others than the carrier. The law specifically provides for rail connections at Barge canal terminals, giving the Commission authority to compel rail carriers to make connection between their tracks and these terminals, at the joint expense of the State and the rail carrier. The operation of such connections is to be in accordance with regulations prescribed by the Commission.

The Commission is empowered to establish through routes and order maximum joint rates between rail and water lines and to determine all the terms and conditions under which such a line shall be operated.

The Commission has authority also to establish maximum proportional rates by rail to and from places to which traffic is brought or from which it is taken by the water carrier and to determine to what traffic and upon what terms such rates shall apply.

If any rail carrier enters into arrangements with any water carrier for the handling of business, the Commission may require such carrier to enter into similar arrangements with any or all other common carriers by water.

No common carrier by rail shall own or have any interest whatsoever, either directly or indirectly, in any manner, in any common carrier by water with which it does or may compete for traffic, or in boats carrying freight upon any water route with which the rail carrier competes. The Commission is given jurisdiction to determine questions of fact as to competition or the possibility of competition, after a full hearing. For determining these questions proceedings may be instituted, either upon application of a carrier or at the volition of the Commission. The status of existing service in regard to this provision may be inquired into and application for new service not in conflict with the provision may be filed.

The requirements of the General Public Service Commissions Law in regard to the filing, the publication and the changes of rates and charges by common carriers are extended to include rail and water carriers on a through route which is partly by rail and partly by water. This provision, however, does not apply to shipments which are wholly by water and are independent of any railroad service.

Such in general are the provisions of the amendment. It applies of course only to intrastate traffic; the Interstate Commerce Commission has jurisdiction over traffic passing from one state into another. It will be noticed that a section prohibiting ownership or control of boats by railroad companies is contained in this law. This section accomplishes what was proposed in 1913 in the attempt to change the Transportation Corporations Law.

In the working out of a portion of this law some difficulty has been encountered. At most places where the railroad companies have been asked to make connections with canal terminals and interchange freight the request has met with compliance, but at Erie basin, Buffalo, the New York Central railroad company, with whose tracks the terminal is connected, refused to perform a switching service between the terminal and industries located on its tracks in Buffalo or with industries situated on the tracks of other railroad lines in Buffalo with which the New York Central connects. The Superintendent of Public Works, therefore, filed a complaint against the railroad with the Public Service Commission, alleging

a violation of the law and asking for an order from the Commission to compel the company to perform the service demanded. The Commission decided in favor of the State, but the railroad disputed the authority of the Commission and in effect refused to comply with its order. The matter was taken to court and the decision rendered was that the Public Service Commission was without power to act. The case has been appealed.

Interchange facilities between railroads and the Barge canal now exist at Buffalo, Rochester, Syracuse, Utica, Schenectady, Troy, Albany and Oswego; also on the Hudson river at Hudson and Beacon.

It is possible now by a combination of Barge canal and lake lines to get through rates, through bills of lading and like privileges for inland ports, but any appreciable degree of coöperation between the canal and the railroads is still lacking. Although the machinery of the law has been provided for securing this coöperation, it has not yet been set in motion. The reason is that canal operators think it much better, even if slower, to secure this end by amicable means than by force. Moreover the operators are not in a position to make any demands for interchange with railroads. Their shipping is so meager that all available boats are required to carry between the Great Lakes and the Atlantic seaboard the bulk cargoes that pass over the Lakes in steamers or barges. There is another strong reason for not invoking the law, particularly the Federal law. Questions concerning interstate traffic come before the Interstate Commerce Commission and any appeal to this body is considered most inadvisable. In the first place it would be the opening wedge toward giving the commission jurisdiction over Barge canal carriers and thus restoring such conditions as prevailed during the United States control of the canal. No well-wisher of the waterway desires a repetition of that experience. Also it is believed that the commission is unfriendly toward canals, the majority of its members being men with railway proclivities. What the operators plan to do is to demonstrate to both the shippers and the railways that service by the canal is just as reliable as is that by rail. They have established minimum canal rates; they give through bills of lading, grant insurance on all water-borne freight and extend other facilities which greatly improve the service they now offer. They expect that when the service is perfected and the fact becomes widely known public opinion will demand and secure a coördination of rail and water carriers.

CHAPTER XVIII

THE CANAL IN OPERATION

Opening of Canal a Gradual Process—Hindrances to Quicker and Fuller Use—Officials Deprecate Condition—Superintendent's Opinion as to Qualifications of Efficient Carriers—Steady Decline in Canal Traffic Arrested in 1917—New Commodities Carried in This Year—Government Control Discourages Canal Traffic in 1918—Business Corporations and War Craft Use Canal—Decline in Traffic Turned to Increase in 1919—Government Activities Lessened—Several Encouraging Features—Superintendent Sees Bright Prospect—Business Conditions Affect Traffic Adversely in 1920—New Common Carriers—New Private Operators—Oil Company Prominent in Use of Canal—New Prospects—Ability to Carry Perishable Products Shown—Traffic Increased in 1921—Combined Lake and Canal Boat Appears—Package Service Inaugurated in Small Way—Plans to Use Canal During Railroad Strike—Promising Association Formed to Promote Canal Use—New Type of Boat—Example of the Manchester Ship Canal

WHEN the State decided to build the Barge canal the authorizing law required, by implication at least, that the canals should be kept open for navigation during the major portion of the usual season all through the years of construction. The opening of the new waterway to navigation, therefore, has been a gradual process, one of adding new sections of enlarged channel piece by piece to a canal already in full operation. Accordingly it is not possible to point to any definite date as the beginning of Barge canal traffic. Of course there came a day, May 15, 1918, when the canal through its whole length could pass boats of full Barge canal dimensions, but for a year or two prior to that time such commerce as does not need the whole extent of the canal for its accommodation had been plying on the new waterway in enlarged craft.

In discussing the commerce on the Barge canal the negative features, if the term may be used, loom larger than the positive. Moreover the recital appears less like a history than an explanation, so many untoward situations have arisen to hinder the building up of canal traffic. Up to the time when considerable portions of the enlarged waterway were opened to traffic, affairs in general had been proceeding according to expectation. It was known that there were not many really good boats in service at the beginning of new canal construction nor many indeed of mediocre or even poorer

quality. The unsettled canal policy of the preceding years had not conducted to any other condition. And no one wondered that after another decade these few boats had become still fewer or that dilapidation and unseaworthiness were fast overtaking them all. Nor was it anticipated that new boats would be built until shortly before the completion of the entire canal project. But just as the time was approaching when boat-builders should get busy, the unlooked-for, the almost unbelievable happened. Boat construction for the canal became impossible because the whole world was at war. This impossibility in turn was followed by a series of events as unfavorable as they were unexpected.

Thus it is that we find the State canal officials deprecating both the lack of boats and the inability of builders to increase the number. In 1915 a considerable portion of the new canal was open to traffic, but by that time costs had reached such a height as to make boat-building, and every other form of construction for that matter, almost prohibitive. And after the United States entered the war, what had been impracticable because of excessive cost became virtually impossible because of inability to secure labor and materials at any price. When peace was restored costs were slow to come down and moreover the Federal authorities retained control of the State canals and private capital would not enter the field in competition. And so, after these several years since the canal was completed, the building up of canal traffic can be said to have only just begun.

But there have been other obstructions and other causes of delay. During the years of new construction the canals, of course, could make no strong appeal to shippers and traffic more and more sought other channels. The railroads were alive to the opportunity and succeeded in turning most of it to their lines. Once diverted it was hard to regain. The old shippers had to be won back and the new generation which had sprung up had to be educated. Then for some unaccountable reason, ignorance it may be, there has been a prejudice against the canals and this has had to be overcome. There has been, too, a wide-spread belief that the canals are suited to carry only a very few kinds of bulky cargo and that passage through them is so slow as to render them almost useless for modern times. Two other barriers, perhaps the most insuperable, and they go hand in hand, are the lack of sufficient transportation companies capable of maintaining a far-reaching, dependable and efficient freight service and the further lack of through routes, through rates, railroad interchange, prorates, through bills of lading and the other privileges accorded by rail carriers.

Reference is made to these hindrances and delays, not by way of apology, but because knowledge of them is necessary to an understanding of canal commerce. Furthermore this subject is so closely allied to the topics discussed in the preceding three chapters that the four must be read virtually as one.

In our further study of canal traffic let us consider for a moment what the two chief canal officials had to say in regard to commerce on the canal soon after any considerable portion was opened by navigation. Their comments will serve to confirm and to amplify what has just been said. In his annual report for 1917, presented to the Legislature of 1918, State Engineer Williams said:

"During the past year much has been said in the public press as to the lack of boats suitable for use on the new canal. It is true that such a condition exists. There are practically no boats of a type suited for efficient operation on the new system and few, if any, are in course of construction. When the canal was planned, it was assumed that the boats to operate in its channel would be provided by private capital, and such was the logical conclusion to draw. The war, however, has entirely changed this aspect of the situation, and without definite assurances from the Federal Government that it will cooperate, it seems very doubtful if capital can be attracted to this field until peace returns. This is not surprising, inasmuch as capital cannot now be induced to take up any new transportation scheme unless the Government renders assistance. The unfortunate condition exists, however, that if a decision to help is not speedily arrived at, this splendid canal will not be permitted to play its part as a war resource this coming navigation season, not because it will not be open for navigation, but because there will be practically no equipment to float upon it."

In speaking of the advisability of use being made of the Barge canal by the Federal government, Superintendent of Public Works Wotherspoon had the following to say in his annual report of 1917. Incidentally it throws light on the subject of canal speed.

"Failure to make use of a waterway possessing all the physical and economical elements required for success, and paralleling the railroad routes, would be looked upon by the future historian as an inexcusable blunder. Whether the canals be used for the carrying of materials and supplies for the armies abroad, or whether they will serve the general business interests of the country, the benefits are the same.

"If economy in freight movement is desired, the canals will supply it. If a prompt and speedy receipt of freight is demanded, the waterway at the present time excels the railroads. Whatever may have been the performance of the railroads in other times, it is a matter that may be proved beyond doubt that cargoes by canal pass from Buffalo to New York in less time than by rail. Already, with a portion of the old canal in use and by means of antiquated canal boats, a fleet has made the trip from the Great Lakes to New York in a little more than seven days. With the new canal route in use for its entire length, five days may be counted as the maximum time of passage.

"To secure a test of comparison, inquiry was made as to the time consumed by the railroads in carrying freight between Buffalo and New York City. Records were sought regarding some half dozen cars. The tracing of one car showed that it was 23 days in transit and the least time taken by any car followed was eight days. Taking the six cars as a whole, the average time consumed by a car in making the trip from Buffalo to New York was 11 days. Arguments, therefore, against water transportation on the ground of slow delivery, are treated with impatience."

In this same report General Wotherspoon gave his opinion of what should be the qualifications of an efficient canal carrier. He said:

"The new waterways of this State constitute a great system. If the people are to receive the benefits had in mind when the project was approved, operations upon it must be conducted in a large way. While some business will await the individual boat-owner, his efforts alone cannot avail in restoring commerce to the canals in sufficient amount to justify their maintenance.

"In the development and transaction of ordinary business, a high degree of efficiency has been reached and the worth of those engaged in operating on the canal will be measured by the same standards. The splendid waterways about to be thrown open for use present a wide field for the activities of energetic, enterprising men who are capable of maintaining a dependable freight service. The organization of an operating company must be equal in efficiency to that of a railroad and the personnel of the management must be such as to command the confidence and respect of the shipping public. The shipper may not be expected to entrust merchandise of high value to a carrier whose ability either to make delivery as required, or render reparation in case of failure, is not assured. As a matter of fact,

the development of canal commerce depends entirely upon the nature of the service rendered. Service not only embraces frequent and regular sailings but also all of the incidental features demanded by the shipper.

"The traffic available for canal transportation moves to and from practically every section of the country. Its first demand is for through routes and through rates. To care for it, canal lines must serve as broad a territory as the competing railroads. They must prorate and interchange traffic with connecting water or rail lines, giving shippers a through bill of lading, with the privilege of specifying through routes, and assume all of the liabilities and conditions of carriage incurred by rail carriers. The rates of the canal companies must be on a fixed basis, published in tariff form, and should include marine insurance. In other words, the companies which shall operate on the new canal should be worthy of the splendid plant placed at their disposal."

We saw in the chapter on Federal control that the year 1918, the first year the Barge canal was open throughout its entire length, was not favorable for private use of the new waterway. Nevertheless General Wotherspoon in commenting on the traffic of this year says that one who studies the record and analyzes the freight movement "can take no discouragement from the results attained, in spite of the fact that the total tonnage fell below the 1917 business by 137,955 tons. He cannot fail to be impressed with the many indications of the rehabilitation of the canals as a commercial factor."

The steady annual decrease of more than fifteen per cent yearly for the preceding ten years was arrested, the Superintendent went on to say, and although the decline was not turned into an increase it was limited to nine per cent. Except for extraordinary conditions, due to the war, it was believed that the 1917 tonnage would have been exceeded. The decrease appeared to be in west-bound traffic, which was accounted for by war conditions, and there was a favorable omen in the increased proportion of through freight. Moreover the canals were not alone in their experience. The record of business done by Great Lakes and Hudson river boat lines disclosed a similar situation. In this year for the first time modern transportation practices were in operation in the stabilizing of rates by publication in tariff form and in the maintenance of a traffic organization having responsible authorities guaranteeing its activities.

Also the efficiency of the canal as a carrier of high class freight was demonstrated. There were certain commodities which were new on the list of canal cargoes or which had not appeared on that list for several years. Among these were gasoline, kerosene and other oils, molasses, coffee, copper, and electrical machinery, apparatus and supplies. Flour too was shipped in considerable quantity for the first time in many years. War orders of knit goods were also shipped by canal. At two Barge canal terminals it was found necessary to build additional warehouses because of the large volume of traffic.

It was in 1917, it will be recalled, that a traffic bureau had been established in the department of the Superintendent of Public Works. During its second year it had been able to reach out into wider fields. For one thing a study had been made of the possibility of shipping coal by canal and the conclusion was reached that in the use of the new waterway lay the solution of the fuel distributing problem for much of New York state territory and even a part of Canada. Early in 1918 the Superintendent presented his plan for coal distribution to the Federal authorities, but the suggestion ended with a partial survey of the situation by Government engineers.

The freight rates that prevailed during 1918 did not favor canal traffic. The United States was in control of the waterways and the parity of rail and canal tariffs at first in force and the later small differential militated against any large use of the canal, even if boats had been available. In the preceding year the State had made provision for cooperative rates between rail and water carriers, but its authority stopped at the State boundaries and moreover canal men did not attempt to have the new law enforced. Accordingly, with the exception of through rates between New York city and some western points by way of the canal and the Great Lakes, there was no coöperation between the various carriers. In spite of repeated urging that it was necessary to establish through rates by all practicable routes between producing and consuming areas tributary to the waterway, in order to broaden the spheres of usefulness and influence of the canal, the Federal government did nothing, although it had acknowledged the wisdom of adopting such a course by the general policy it had followed in other parts of the country.

One gratifying aspect of canal traffic was the use made of the waterway by several large business corporations, which operated

their own boats for carrying their own raw materials or manufactured products. Two companies to enter this field in 1918 are among the largest business concerns in the country. A somewhat incidental but a very important use of the Barge canal in both 1917 and 1918 was that made, chiefly by the United States, for the passage of war and other craft built at inland shipyards, such as submarine chasers, mine layers, mine sweepers and steel trawlers, or such as car ferries, floats and tugboats or an occasional large boat, which was being transferred from lakes to ocean service.

When we review the traffic on the canals for 1919 we find that this year turned the tide of decrease that had been going on for a decade or more into an actual increase. It exceeded the tonnage of 1918 by about seven per cent and the increase on the Erie branch was about twenty-five per cent. In our consideration of Federal control it was shown how the Railroad Administration had agreed to lessen its activities in several particulars during this year. The beneficial effect was obvious even in the face of the continued menace of Government operation. A most important concession was gained in the establishment of certain through rates to the west. For the first time in the history of the canals shippers in New England were enabled to utilize the New York canal route to western territory on a differential rate basis. Also there was an encouraging prospect in the activity manifested by several industrial corporations, some of them of national repute, in seeking manufacturing and warehouse sites along the new waterway. In reporting on the navigation of the year the Superintendent of Public Works gave an interesting incident. He said that a fleet composed of boats of the old type made the trip from seaboard to Lake Erie in four and two-thirds days, a record never before achieved.

In his annual report for 1920 Superintendent of Public Works Walsh said:

"The years 1918, 1919 and 1920 have marked the turning point in canal traffic. An average annual decrease of approximately 15% was arrested in 1918 and but a 9% decrease was shown that year. The season of 1919 produced an increase of 7% over the preceding year and 1920 surpassed the 1919 record by 15%. In a sense, therefore, the total gain since the new waterway came into use is about 30%, and with this start, accomplished during a period of the Nation's history fraught with difficulties and obstacles that were not easily overcome, I predict a constantly increasing annual

traffic. In my judgment the next five years will witness the restoration of a water-borne commerce through the State between the Niagara Frontier and tidewater that will eclipse even the wonderful achievement of the original Erie Canal. Inland waterway transportation generally is coming into more and more favorable regard throughout the country. The shipping public is returning to first principles. The transportation instrumentalities that contributed more than any other factor to the building up of the country in the early days — the natural water courses — have again come to be considered by straight thinking men as invaluable assets and facilities deserving of utilization and development. An unwavering policy of modernizing these facilities on the part of Federal and State Governments offers, in my opinion, the final solution of our great transportation problem."

It should be remembered that these are the words of a man who has spent his life in the transportation business, chiefly on the State waterways.

At its beginning the year 1920 bade fair to show a much greater increase in canal traffic than the figures for the whole year actually recorded. For the first month the traffic was double that of the preceding year, but later there came adverse conditions. A general business depression curtailed production and there was much less to be shipped, by either rail or water. What little building there was almost ceased. Also there was decreased production at the coal mines. The grain business, although there were bumper crops, was disappointing. An acute car shortage in the grain country held back the movement till almost the close of the navigation season. Also a sharp decline in the grain market made those who had bought at a high figure more anxious for a quick delivery that would enable them to turn over their capital with a minimum of loss than for saving a few cents a bushel in carrying charges, and this turned the traffic away from the canal. But of greater effect were the preferential grain rates between the Missouri river territory and the Gulf ports. The largest surplus of domestic exportable grain was in Kansas and Nebraska and ordinarily the bulk of this commerce would have moved by rail and lake through Chicago or Milwaukee to Buffalo and there have been available for canal traffic. But a maladjustment of rates, as the Superintendent of Public Works termed it, favored the all-rail route to the south and diverted most of the Missouri river crop from the usual rail-lake-Atlantic route to the Gulf ports. In this experience the Superin-

tendent saw a very grave menace to the prosperity of the ports not alone of Buffalo and New York but of Boston, Baltimore and Philadelphia as well. It was a subject, he considered, which demanded the most careful attention and possibly litigation before the Interstate Commerce Commission.

The year 1920 witnessed the entrance of four new transportation companies in the common carrier service on the canal; also the large expansion of another and the broadening of the scope of service of a sixth. Among the four new companies was one which promised to be the foremost canal carrier. Back of it was a corporation formed primarily for ocean service and the canal activity was supplemental to its ocean business. The permanence of the operations of this company as well as the efficiency of its service was guaranteed by the substantial character of its members. Its entrance into canal transportation was the first evidence of big business recognizing the opportunities for profitable operation offered by the new waterway and so it was most gladly welcomed by shipping interests.

The year 1920 witnessed also several newcomers among the industrial concerns operating their own boats on the canal. The most active of the private operators, the Standard Oil Company of New York, calls for special notice of its canal business. It was one of the first to use the new canal and in 1920 its fleet had grown to nine tank barges, each having a capacity of nearly 200,000 gallons, and these were in constant service. From a distributing base on the Hudson river at Albany cargoes were carried to cities and villages situated on all of the four enlarged canals, the company having acquired property adjacent to the waterways and having erected large storage tanks on the shores. At Rochester in 1920 the company spent more than \$100,000 in providing a harbor and docking facilities for its barges and its investment in property and terminals along the State canals, together with its canal floating equipment, ran into the millions of dollars. During the 1920 season these barges had a mileage record of 29,316 miles and they carried 94,862 tons of petroleum products. It is said that during the season the company did not ship one carload by rail to such of its stations as had both rail and canal connections, all of the supply going by water. Moreover the company had under construction five self-propelled tankers, each of 700 tons capacity, which it was building for the next season. "I accept the interest and operations of this huge corporation," said the Superintendent of Public Works, "as final proof of the efficiency

of the new canal system. Sagacious in the extreme the corporation early made preparation for an extensive utilization of the Barge Canal System, even before the new waterway assumed completed proportions, and the annually increasing volume of tonnage carried through the canals by its tank barges gives conclusive answer to those who question the economy of canal shipping."

The prospect opened by the 1920 season was bright. New sources of traffic were being developed. Among these was imported flax-seed, 81,465 tons being carried from New York to Buffalo. With the completion of the grain elevator at New York an increase in this commodity was expected. A large corporation owning great tracts of timber land in Canada established a pulpwood distributing terminal on the canal at Oswego. Maine pulpwood companies were getting ready to ship over the canal many thousand tons of their wood. The location of an internationally famous rubber manufacturing concern at Buffalo presented the prospect of carrying by canal crude rubber and other imported raw materials. A large power-developing company in the lower Mohawk region was planning to bring by canal the 75,000 tons or more of coal it would need each year.

The season of 1920 also demonstrated the value of the canal as a carrier of other than low grade and coarse freights. Many barge loads of perishable commodities, such as potatoes, apples and onions, were handled, so that even the development of a refrigerator barge was considered. A peculiar but interesting instance of perishable freight was a cargo of live eels. This shipment, originating at Quebec and carried in four specially constructed barges, entered the canal at Oswego and was speedily transported to the New York market. This unusual venture was so successful that its promoter arranged for building other boats, planning to carry on a regular traffic in eels the next year.

Speaking of the possibilities of future canal business, Superintendent Walsh, in his annual report for the year 1920, said:

"There is no commodity produced or consumed throughout the territory traversed or connected by the waterway that is not potential canal freight. Everything that is transported by rail lines can be safely and economically carried in canal service. A tremendous volume of tonnage awaits the inauguration of a high class transportation service on the waterway and, with the creation of such service, the success of the undertaking will be assured."

The traffic on the canals in 1921 showed an increase over that of the preceding year. In some respects this increase was quite marked. The grain trade increased more than two hundred per cent and was limited only by the number of boats available. The record for the year was 13,736,010 bushels, or 365,990 tons. Among other commodities the large shipments of building brick were noteworthy. Considerable quantities of phosphate rock, nitrate of soda and crude sulphur were sent from Florida to Trenton, Ontario. The rates quoted the shippers on these latter materials were for transportation from the mines to the final destination, including the ocean passage, and it is said that the water route effected a saving of \$2 50 per ton compared with rail rates. The sending of automobiles by canal had become so common as to have lost its novelty. Begun a year before because of a scarcity of railroad cars, it had been continued because shippers appreciated the advantage the canal gave in a saving of both time and money. There were certain commodities which showed reduced shipments in 1921, but in nearly every instance the decrease simply reflected the business depression of the period.

A new type of vessel made its appearance on the canal in 1921, a boat used for combined lake and canal service, although it was intended originally only for canal use. There were five of these vessels and the first to traverse the canal carried a cargo of 83,000 bushels of oats (1,328 tons) from the head of the Lakes to the ocean. The boats measured 242.6 feet by 36.1 feet, thus filling the canal locks well toward their full capacity, and were designed to carry 1,500 tons on a ten-foot and 1,750 tons on an eleven-foot draft. The greatest load any of them carried during the season was a little over 1,600 tons. Each boat was equipped with two 140-horse-power semi-Diesel oil engines and twin screws. This fleet was an important innovation, which in a way promised much for the Barge canal. Still it attempted to do something that was not contemplated when the Barge canal was begun, namely, to combine equally successful and economical navigation of both the lakes and the canal in a single boat. The record of the fleet has not yet proved that such a thing can be done.

The boats owned by corporations and used for shipping their own products continued in successful operation. The most conspicuous example, the Standard Oil Company, placed in service the five power cargo barges it had been building the year before and also some other new barges. This company's boats had a total mileage in 1921 of 60,326 miles and a record of transporting 39,016,063 gallons of oil products, or a tonnage of 128,754 tons.

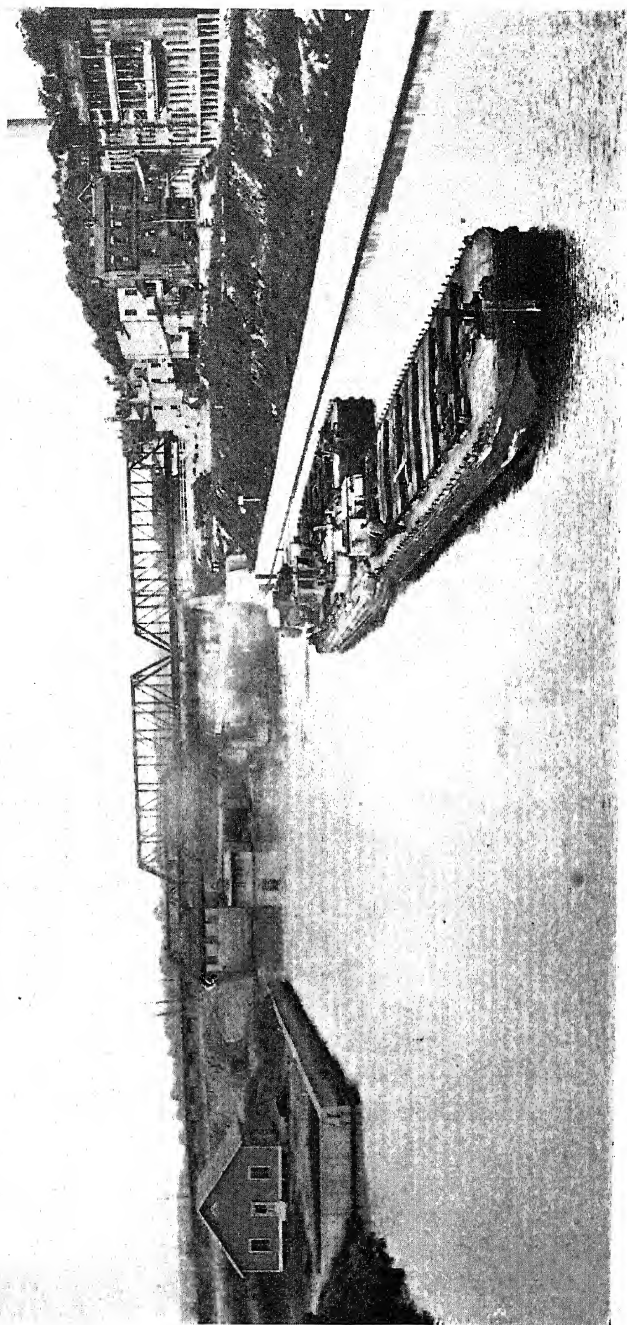
A package service was inaugurated in a small way during the year and this gave promise of growing into something that would fill a long-felt need. Superintendent Cadle mentioned this in his annual report as a favorable indication. A service of this kind would have to be quick in order to succeed and there was a wide field for exploitation, in such cargoes for example as shipments to upstate markets of fruit received at New York by water from California or the South. The canal had been used to some extent for carrying home-grown apples, potatoes and onions, but its advantages for such purpose were as yet not well appreciated. A package service would help in this respect. Pacific coast lumber, coming by water through the Panama canal, continued to be reshipped through the Barge canal and the prospect was good for increased traffic in this material.

The Superintendent appointed a publicity agent in 1921 and considerable was done by way of spreading information concerning the canal through this new channel. Press articles, public meetings, lectures at colleges and schools and motion pictures were the tools in this educational campaign.

The canal was kept open till December 25, 1921, a record without precedent in any recent years.

In October of this year it seemed for a time very probable that there would be a strike which would tie up all the railroads of the land. That the people of the state might suffer as little as possible from such an occurrence Governor Miller took steps so to organize shipping by canal and highway that all needs would be met. The Governor appointed a special emergency committee, of which the Superintendent of Public Works was chairman and the Commissioner of Highways, the Commissioner of Farms and Markets, the Adjutant-General and the Superintendent of State Police were the other members. Forty-eight hours after its appointment this committee had perfected an organization which, it was felt, would be sufficient for the emergency. The strike, however, was averted and the need for using the canals and highways as the sole means of transportation passed. Nevertheless there was comfort to the citizens in the feeling that there were at hand means for preventing such a calamity as was threatened. In this connection a most pertinent query presents itself: If the canals are so valuable in an emergency, why not recognize their value for ordinary occasions, why not use them to their capacity all the time?

The year 1921 witnessed the formation of an organization which should go far in bringing such measure of success to the Barge



Example of many canal structures in close proximity — at Lyons. At the left a terminal with a frame warehouse; in the distance a lock, two Taintor gates, a spillway, a power-house, a highway bridge, a highway bridge and an electric railway bridge. The boats are of modern type, built expressly for Barge canal traffic.

canal as it deserves. This organization seems to be founded on the right principle, that of securing for waterways what is absolutely essential, if they are to succeed, and doing it by the most practical and reasonable means. The organization is named The Great Lakes, Hudson and Atlantic Waterways Association, Inc. It was formed at Albany on March 16 and held its first convention in Buffalo on June 29, 1921. The personnel of the Association and the purpose for which it was established as well as what it has already done give promise that it will meet the real needs of adopting some definite plan to make our inland waterways fulfill their mission as transportation routes and of bringing ocean facilities to the inland shipper. The Association does not favor any particular waterway, but came together in full appreciation of the fact that the time had arrived when selfish and partisan ends should be put aside and all believers in waterways should stand together and by united effort secure the benefits that may be expected to follow a full and intelligent use of all water routes. The organization is lending its influence toward the establishment of uniform rates on barge lines operating between the Great Lakes and the Hudson, the maintenance of regular schedules, the preparation of official classifications of freights and the issuance of through bills of lading from inland cities to foreign ports. In a word, it is undertaking the task of bringing ocean transportation facilities to the inland shipper by applying the principles which govern the operation of ocean vessels to the inland water carrier. Since the Association is made up largely of men engaged in the business of transportation, such aims as it professes seem certain of effecting beneficial results. A phrase used at the meetings of the organization aptly defines its task—to make the public canal-minded. This task, to borrow another phrase, one from a speaker at the first convention, is to do what the old proverb declares to be impossible—not only to lead the public to water, but also to make it drink, or, in traffic language, to make it use the canal.

A very important requisite to canal success is complete coöperation between rail and water carriers. As explained elsewhere this desideratum has not yet been secured for the Barge canal, but the operators think they can accomplish more by amicable relations with the railroads than by forcing them to do something against their will and so the law has not been invoked to right what appears to most persons to be a grave injustice against the public.

It may be that a recent boat design will do more to bring commerce to the canal than anything that has gone before. The new

design uses in part the principle of the speed boat known as a sea-sled, but the craft is more like a catamaran. Its chief virtue is the high rate of speed without washing the banks. To make the curves at high speed a special steering device is necessary. A certain type of racing boat has a rudder forward as well as aft; the new canal boat secures the same result by an arrangement of pontoons. Canal boats already make better time than the average rail shipment. If the new design can reduce this time materially, the canal will have a most signal advantage over the railways.

This chapter, because its subject deals with a period of transition and growth, cannot be finished. The building up of traffic on the new canal has begun and recent developments have made the prospect look bright, but much still remains to be accomplished. It is probable that people in general have very little idea how stupendous, under conditions as they now exist, is the task of bringing to the canal the volume of traffic which it is capable of handling and which, in the opinion of waterway advocates, it should handle, both right-fully and to the benefit of the State and its citizens. What the general manager of the Manchester ship canal said concerning the development of commerce on that waterway will help us to understand why we should not yet expect the Barge canal to have attained a large amount of success. We quote a paragraph from the report of the Commission on Barge Canal Operation, which contains this statement.

"A practical example of what organization means," said the Commission, "is to be found in the management of the Manchester canal, Manchester, England. This being a ship canal it is generally dismissed from consideration when internal waterways are under discussion. Though this waterway was intended for ocean-going ships, no more practical lesson has ever been taught than is contained in the history of and the results already attained on this canal. The enterprise was undertaken and carried through by private capital, and though the thousands of stockholders have as yet received no return in the way of direct dividends, the original investment has been returned many fold in the way of increased values and expansion of industry. A city which is said to have been on the verge of extinction as a city of importance has been redeemed and nearly doubled in population in less than twenty years, and the prosperity of a territory within a radius of forty miles has been permanently assured. A reduction in rates for delivery on all classes of goods from 40 to 80 per cent. has insured universal participation in the

benefits. This, too, has been accomplished without detriment to Liverpool, to which Manchester and vicinity previously paid heavy tribute, for Liverpool's growth and expansion have kept pace with those of Manchester. How this has been accomplished is best summarized by Mr. Herbert L. Gibson, General Manager of the Manchester Ship Canal: 'The struggle of carrying the bill, authorizing the construction of the canal, through Parliament, was strenuous and exhausting. The engineering feats were executed in a manner to excite the admiration of visitors from all parts of the world; but great as have been the efforts put forth in these directions, they were nothing to the tremendous task of diverting traffic from beaten tracks to this new route. *This has been done only through organization and the employment of trained experts.* In spite of all that has been accomplished we feel that as yet we have only touched the fringe of a commerce which will ultimately go to Manchester.' "

CHAPTER XIX

ATTEMPTS TO ADD OTHER BRANCHES

Desire to Share in Original Canal Benefits—Like Desire to Share in Barge Canal Benefits—Black River Canal Extension. History of Building Black River Canal: Early Arguments. Previous Agitation for Extension: Recent Agitation. Surveys and Estimates. Attempted Authorization. Repairs to Existing Canal—Chemung Canal Reconstruction. Effect of Revolutionary Expedition. State Canal Built. Vicissitudes of Waterway. Private Canal Built. Both Parts Abandoned: Recent Survey and Estimate—Glens Falls Feeder Conversion. Topography and History. Retained as Barge Canal Feeder. Survey and Estimates. Discussion of Expediency—Jamaica Bay-Flushing Bay Canal. Topography. Influence of Jamaica Bay Terminal. Agitation. Route and Three Types of Canal Discussed: Estimates. Benefits Claimed—Newtown Creek-Flushing Bay Canal: Route. Estimate. Benefits Claimed—Summary of 1913 Estimates—Barge Canal Branch, Seneca River to Auburn: Route. Estimate. Analysis of Cost of Carriage—Improvement, Tonawanda to Buffalo: Navigation against Current Involved: Investigation Conducted. Report against Project. Estimates—Some Principles Governing Canal Economics.

IT HAS been true of most great movements that they have engendered a spirit of emulation. And when these movements have had large promise of beneficence, this spirit has been augmented by the stimulus of a strong desire to share in the benefits. Thus in the case of our own canal, the original Erie, the great pioneer of American waterways, its completion and early success was followed by a veritable frenzy for canal-building throughout the country. In New York state this zeal manifested itself in a flood of petitions to the Legislature for the opening of waterways, in the surveys of hundreds of miles of proposed routes and the building of several lateral canals and in the incorporation of more than sixty private canal companies. One act alone, what is known as the "great canal law" of 1825, ordered the surveys of seventeen contemplated canals, covering a distance of over twelve hundred miles. Within the first decade after the opening of the Erie and Champlain canals six more State canals were built and during the next four years still four others were authorized.

So again, to share in the promised good of the Barge canal, the people of several sections of the state have sought and obtained

surveys and investigations of various routes along which they have desired to have built additional branches to the new canal system. On none of these projects, however, has the agitation passed beyond this preliminary stage and the reason for this is not hard to find. Primarily the need for waterway enlargement to Barge canal dimensions was felt for the Erie canal alone, but before the improvement of that branch was authorized two other canals were included in the scheme, and this was done, as we have seen, partly for the purpose of securing united support for the whole canal movement. Then a few years later a fourth branch was added, so that now the four main State canals, the four that on previous occasions had been deemed worth enlarging, have been increased to uniform Barge canal dimensions. Although these other examinations, which we are about to consider, have been made and in some cases careful surveys and estimates and tentative plans have been added, there has not existed sufficient public demand to push any of them to the point of very serious consideration. Doubtless our experience with our abandoned lateral canals has taught us caution, and also there seems to be abroad a better appreciation of the principle now generally recognized by those conversant with the subject, that waterways which do not connect large industrial centers nor reach the source of some extended natural supply are not worthy of construction.

We would not say, however, that any of the proposed routes which the State has ordered to be examined within the past few years should be rejected because of adverse decision under the principle just enunciated. That is not a question for us to determine. Perhaps the days to come may see canals built with profit along some of these lines. But historically these investigations are of interest to us, irrespective of any future prospects, and we shall study each in turn with some care. Also, outside the borders of New York state but connected more or less directly with the Barge canal system there have been proposed other important canal projects. A little later these too will engage our attention, but for the present we shall confine our thought to our own particular schemes.

BLACK RIVER CANAL EXTENSION

The first of the projects to receive legislative authority for investigation was that along the course of the Black river from Carthage to Lake Ontario. In 1911 the Legislature (by chapter 190) directed the State Engineer to make a survey and prepare plans and estimates for improving the Black river for navigation

between the State dam at Carthage and Sacketts Harbor, on Lake Ontario. To understand this project we need to know a little of what has gone before in this region.

The story of the attempts to provide waterways for this North country, the failures as well as the successes, is most interesting. Like other branches of the State system the career of the Black River canal and its adjuncts has been rather checkered. First came the incorporation of the Black River Navigation Company. In 1810 this body was given power to improve the river from Lake Ontario to Brownville, a village lying some four or five miles up the river. It is recorded in the annals of Jefferson county that this company built the necessary wooden locks at Dexter, near the lake, and that later, in 1828, these were rebuilt of stone to accommodate a steamer named "Brownville," which had a length of 80 feet, a beam of 20 feet, a hold depth of 6½ feet, a capacity of 100 tons and engines of 35 to 40 horse-power, and was built in the village of Brownville. It was the intent to use this vessel for traffic to and from Ogdensburg, but after having passed the locks with difficulty she was burned to the water's edge on her first trip.

Among the canal surveys ordered by the "great canal law" of 1825 were two to connect the Erie canal with the St. Lawrence river at Ogdensburg. Because the law was somewhat obscure as to its meaning the engineer who made the surveys, James Geddes, one of the best known of the Erie canal engineers during its preliminary survey and construction stages, ran lines over three routes, one from Herkimer to the upper waters of Black river and thence to the St. Lawrence near Ogdensburg, another from Rome through Boonville to what is known as High falls on the Black river, thence in the river for forty miles to Carthage and beyond that north through the village of Gouverneur and down the Oswegatchie river to Ogdensburg, and the third from Fort Bull, a little west of Rome, up Fish creek valley, through Camden, and on north across Salmon and Black river valleys into West creek valley and thence on to Indian river valley and down that valley and through Black lake to Ogdensburg.

Like many another of these early canal surveys, the construction of the waterway did not follow. In this case, however, the canal was built eventually. The route selected was substantially the second of those just described, but terminating at Carthage. In 1836 this was authorized; between 1838 and 1855 the main canal was constructed. It left the Erie canal at Rome and ran north, fol-

lowing the Mohawk river valley as far as that was available; it approached the Black river valley at Boonville, where it attained its summit level, continuing it descended to the north, paralleling the Black river and finally dropping into that stream at the village of Lyons Falls. This canal was supplied with water through a feeder from Boonville to Forestport, which was built between 1838 and 1848. The work of making the river navigable between Lyons Falls and Carthage was begun in 1854 and finished in 1861. This portion of the waterway has been known in canal history as the Black River Improvement; in its natural state it was almost capable of being used for navigation.

The number of locks on the Black River canal is unusually large. Between Rome and Lyons Falls, a distance of about 35 miles, there are 109 locks, or an average of more than three to the mile. This peculiarity of contour led to some very interesting investigations before the canal was built. The plan of placing boats on cradles and running them up inclined planes on rails was seriously considered. This was the only New York canal for which such plan was ever contemplated.

The Black River canal is still a part of the State system, but only a portion of it has been much in use of late. From Boonville south it is open for traffic. Years ago the river navigation was cut off by reason of the dilapidated condition of the connecting lock. Until recent repairs the section between Boonville and Lyons Falls was for years in such condition that it was seldom used.

When petitions were being presented to the Legislature for the building of the Black River canal the large lumber supply in this vicinity and the importance of this section of the state as an agricultural, dairy and grazing region were among the chief arguments in its support. Another reason for constructing this canal was the need of the water it could bring to the Erie canal. Mr. Geddes in the report of his survey in 1826 had cited this possibility and without doubt this proved to be the strongest reason of all those advanced. It is probable that the canal would have been abandoned long since, except for this need. In fact in 1874 the constitutional restriction forbidding its sale was removed from this branch along with other lateral canals subsequently abandoned and only a favorable report by a special commission of expert investigators saved it from the fate of the others. Moreover, that the value of this canal as a water feeder was recognized from the beginning is shown by the official name bestowed upon it by the authorizing law, which

states that it shall be known as "The Black River Canal and Erie Canal Feeder."

During the many years since the Black River canal was begun the State has been engaged in constructing an extensive system of reservoirs in the Adirondack forest, those on the headwaters of the Black river being used for storing a canal supply, while others replace the amount of water diverted from the Black river for canal purposes. The Black River canal is the channel through which the canal supply reaches the Erie branch. And now these reservoirs and the connecting canal have been retained for the Barge canal and in addition two vastly larger reservoirs have been built close to the old system.

Almost as soon as construction work had begun on the Black River canal, agitation was started for extending the waterway in various directions, and among the routes proposed at that time was one which was substantially the same as that surveyed in 1911 and 1912. In response to petitions in 1838 and again in 1839 the Legislature of the latter year made provision for surveying these routes. In 1840 the report of the engineer, Edward H. Brodhead, was submitted to the Legislature. The estimated cost of the proposed canal of that early day becomes interesting in comparison with the estimates of the recent survey. Of course the two are not truly comparable, since the sizes and character of waterway and the conditions of building are so widely different. A brief summary of Mr. Brodhead's estimates shows the following:

Carthage to Sacketts Harbor — Length, $31\frac{1}{4}$ miles; 50 locks, 480 feet lockage, total cost with stone locks, \$1,444,614.28, with composite locks, \$1,230,629.28, with wooden locks, \$1,040,027.28.

Carthage to Dexter — Length, $27\frac{3}{4}$ miles, 50 locks, 480 feet lockage, total cost with stone locks, \$1,394,036.32, with composite locks, \$1,180,176.02, with wooden locks, \$988,943.02.

Carthage to French Creek (now Clayton) — Length, $34\frac{1}{2}$ miles; 48 locks, 480 feet lockage, total cost with stone locks, \$1,327,874.67, with composite locks, \$1,086,585.67, with wooden locks, \$894,108.67.

Carthage to Ogdensburg — via Oxbow and Oswegatchie river — Length, $77\frac{1}{8}$ miles; 54 locks, 527 feet lockage, total cost with stone locks, \$1,681,150.41, with composite locks, \$1,417,410.41, with wooden locks, \$1,179,910.41. Via Gouverneur — Length, $72\frac{3}{8}$ miles; 64 locks, 621 feet lockage, total cost with stone locks, \$2,515,199.87, with composite locks, \$2,217,566.87, with wooden locks, \$1,948,150.87. Via Little Bow Landing and Oswegatchie river —

Length, $72\frac{3}{8}$ miles; 53 locks, 517 feet lockage, total cost with stone locks, \$1,954,274.48, with composite locks, \$1,688,433.48, with wooden locks, \$1,447,230.48.

The introduction of a bill to build the extension followed the presentation of the report, but it was defeated upon final vote. The Assembly, however, passed a resolution asking the canal commissioners for a report on the probable amount of revenue to be derived from the proposed extension and also the probable increase which might be expected from the canal already under construction if the extension were added. At the next session, 1841, the commissioners made a report as directed, but it was evasive and imparted no satisfactory information. A bill for the undertaking introduced that year did not emerge from committee and although the agitation continued for a while, in a few years the whole matter dropped out of sight.

One of the reasons urged at that time for the extension is worth a brief glance. It was argued that from a military point of view it was necessary that the Black River canal should extend to Lake Ontario, since the British Government, at considerable expense, had within a few years constructed the Rideau canal, which gave them safe passage to the eastern end of the lake through the interior of Canada. This short extension in New York, it was urged, would enable the United States to maintain its position in time of war at a great saving of expenses in the transportation of armaments and stores. In a way this argument was good, especially at that time. Of course we already had entrance into Lake Ontario by way of the Oswego canal, but there is a large reach of border at the eastern end of the lake north of Oswego. It is a fact that during the War of 1812 Sacketts Harbor was considered so important a post that large amounts of military stores were carried thither overland through the Black River country at an expense, it is said, of more than two million dollars.

But to come to the subject immediately in hand—the recent agitation for a canal of modern size between Carthage and Lake Ontario. About 1911 the people of northern New York are said to have become much aroused over the lack of transportation facilities in their territory, there being only one railroad within a region of considerable extent. They could see but little prospect of further development unless better means for transportation were afforded and they had little or no hope that these increased facilities would come through the extension of the existing railroad or

through the building of competing lines. Their deliverance, therefore, from a condition that was rapidly becoming acute seemed to lie in the repair and extension of the Black River canal. Once this idea took hold of the people of this region they all became enthusiasts for a new canal—the scheme to include not only substantial repairs to the existing canal, which stretched from Rome to Carthage, but also an extension, to have Barge canal dimensions, from Carthage to Lake Ontario. They urged their representatives in the Legislature to work toward this end and the result was an appropriation of \$50,000 for repairing the old canal between Boonville and Carthage and also a sum for making a survey of the proposed extension.

It had been learned from a statistical survey of the region that there was at that time an annual in-bound and out-bound traffic of a million and a half tons suitable for canal carriage. The main force impelling the people to seek new transporting facilities, however, was a desire to expand commercially. Development was at a standstill and industrial growth must cease, they declared, unless better means for carrying their products should be afforded. This is largely an agricultural and a grazing country and also the manufactures are of considerable importance, particularly the making of paper. The mineral resources also are of no mean proportions. There abound high grade magnetic iron ore, iron pyrites, marble, limestone, sandstone and granite and in smaller quantity there are zinc, lead and hematite. Large development along all these lines, agriculture, manufacturing and mining, was probable, the people thought, but it all seemed contingent on better transportation.

Although the appropriation for the State Engineer's survey of the new route was not large the investigation was thorough and the resulting estimate from tentative plans reasonably accurate. Every feasible route or portion of route was surveyed and estimates made along each, so as to allow a selection of the best. The question of water-supply was carefully studied and the estimates included amounts for suitable storage reservoirs and feeders. Care was taken to include sums for all probable land purchases and damage claims. The experience gained on the Barge canal was applied to all parts of the surveys and estimates. The law called for examination solely along engineering lines and therefore no attempt was made to investigate traffic conditions or any feature which might bear on the question of advisability of construction. Louis A. Burns, Resident Engineer, was in immediate charge of making the surveys and esti-

mates. His partial report is contained in the annual report of the State Engineer for the year 1911 and his complete report, which goes into considerable detail, in that for 1912.

A summary of this report shows a length of 31 36 miles according to the selected route, a need of 24 locks and an estimated cost of \$16,319,580 for the waterway, if the prism should be the same size as that of the Barge canal and the locks 45 feet wide by 328 feet long between gates. For a channel of the same size but with locks somewhat smaller, 28 feet wide by 188 feet long between gates, the estimate was \$14,605,980. In 1913 the Legislature ordered the surveys of five prospective canals, the Black River extension being one of them. In reporting on these surveys the State Engineer said that subsequent to his former report the courts had handed down certain decisions with respect to the settlement of damages growing out of the appropriation of lands and waters which warranted a review of the earlier estimate and therefore he would increase the estimate from \$16,300,000 to \$19,000,000.

In March, 1912, before the full report of the survey was quite completed, at the direction of the State Engineer, Mr. Burns made a verbal report and submitted estimates of cost in round numbers on five tentative propositions. This was done for the purpose of securing information upon which a legislative bill might be drafted. This bill as first introduced carried the sum of \$14,000,000 for a canal with prism of Barge canal dimensions but locks of the smaller size. Later a new bill was substituted and in this the amount was \$16,000,000, which provided for a waterway with both prism and locks of full Barge canal dimensions. In its course through the Legislature two other schemes had been included in this bill, one the enlargement of the Glens Falls feeder and the other the reconstruction of the Chemung canal. The bill carried a total of \$25,000,000 and passed both branches of the Legislature, but failed of approval by the Governor. The reason assigned by the Governor for his veto was the greater need at that time for funds to complete the State good roads system.

Again the next year a referendum canal measure was introduced in the Legislature. This included besides the three canals contained in the 1912 bill two additional propositions, one a waterway to connect Flushing and Jamaica bays and the other the reconstruction of the abandoned Delaware and Hudson canal from Rondout on the Hudson river to the Pennsylvania line. It carried an appropriation of \$55,000,000. In the Assembly it passed to third reading, but was

recommitted after several fruitless attempts to get the Governor to sanction its passage. He objected on the very reasonable ground that only for the Black River project had surveys and reliable estimates been made and it was better, he thought, to wait until the other routes should be surveyed before submitting to the electorate any proposition concerning them. Furthermore he deemed the erection of public buildings of so much greater importance at that time that it should take antecedence over the canal bill

Another bill affecting the Black River project had a place in the 1913 Legislature. Under the appropriation for work on the old canal from Boonville north, repairs had been made as far as Lyons Falls, the place where the canal begins to use the Black river channel in its further course to Carthage. This work was done during 1911 and 1912 and had been accomplished well within the \$50,000 appropriated, but there still remained the dredging of the river section, which it was proposed to do in 1913. It was found, however, that additional funds would be needed and so a bill calling for \$50,000 was introduced. The repairs already made would be of small avail unless the whole scheme were complete. This bill passed the Legislature, but was vetoed by the Governor without comment.

Acting on the suggestion of the Governor the Legislature of 1913 passed a bill for additional canal surveys, which received his approval. This is the law under which were made the four surveys we are about to consider. But before entering on these discussions it may be added that in the next attempt to push the Black River scheme it was linked in legislative experience with three of the other projects surveyed under this law. In 1914 this omnibus canal bill was introduced and passed the Assembly near the close of the session but failed of passage in the Senate. It carried a bond issue of \$68,000,000 and included four projects, the Black River, the Chemung, the Glens Falls feeder and the Jamaica Bay-Flushing Bay.

The law of 1913 (chapter 220) which enjoined upon the State Engineer the work of surveying five proposed canals described the several projects as "the extension of the Black River canal, the reconstruction of the Chemung canal, the conversion of the Glens Falls feeder into a canal, the construction of a canal between Flushing river and Jamaica bay and the construction of a canal from Newtown creek, sometimes known as Nassau river, to connect with the proposed canal between Flushing bay and Jamaica bay." As the investigation of the Black River extension had been completed scarcely a year earlier, new surveys were made only for the four other waterways. We shall consider them in the order of mention in the law.

CHEMUNG CANAL RECONSTRUCTION

As the phrasing indicates, the Chemung canal project contemplated the rebuilding of a waterway which once existed, or more properly speaking, two waterways, for one was built by the State between 1830 and 1833 and the other by private capital between 1852 and 1858. Moreover one short section of the old Chemung canal had already been reopened, being considered a part of the Cayuga and Seneca branch of the Barge canal. To familiarize ourselves with the situation and to understand the reasons which prompted the desire for this addition to the State transportation system, we must again look into the history of previous canal activities.

The early peopling with white settlers of the valley of Chemung river and also of much of the adjacent finger lakes region came as a direct result of one of the most important military expeditions of the Revolution. In that war the colonists tried to induce the Indians to remain neutral, but in this they were not successful and most of the red men, who then inhabited and ruled the territory west of Oneida lake, became the allies of our foes. The tragedies of the ensuing savage warfare provoked the colonists beyond endurance and when these culminated in the horrors of Wyoming and Cherry Valley they were driven to a campaign of reprisal, which resulted in breaking forever the power of the Six Nations, that formidable Iroquois confederacy. General Sullivan conducted this campaign and in it a third of the Continental army was engaged. His forces advanced from the south through Pennsylvania and at Tioga Point were reinforced by troops under General James Clinton, who had come down the Susquehanna valley. Pushing on near to the place where Elmira now stands, they encountered and in a most desperate battle defeated the Indians, who had gathered there in force to meet them under Brant and Butler. Sullivan's victorious army swept northward and westward, leaving ruin and devastation everywhere in its wake, thus carrying out Washington's orders to inflict on the Indians every injury which time and circumstance would permit.

During this expedition General Sullivan had addressed a letter to General Washington on the subject of uniting the northern and the southern waters. Washington had for years been intensely interested in waterway projects. His love for his country found expression in the desire for her prosperity above all else and his training as an engineer led him to see in improved transportation one of the greatest means toward the end. He appreciated the possibilities

disclosed by Sullivan's letter and presented the matter to Congress, but without result. This was probably the first suggestion for waterway improvement along the route later occupied by the Chemung canal. After the war the treaty of Fort Stanwix threw this region open to white settlement and the stories told by the soldiers in praise of the fertility and beauty of the Chemung valley quickly brought a tide of emigration to this fair land. Thus it was that the Chemung valley was early settled by the whites and had a part in the first of the agitation for canals. As early as 1812, five years before the Erie was begun, James Geddes, under the direction of the canal commissioners, explored the route for this prospective canal and reported favorably upon it.

To appreciate the feeling of the early advocates for the Chemung canal one must remember that only about twenty miles separated the head of Seneca lake from the Chemung river at Elmira, that Seneca lake stretched northward for some forty miles and beyond that there flowed a great river which led either to Lake Ontario and on down through its mighty outlet to the sea, the St. Lawrence, or to the Mohawk and the Hudson rivers by way of Oneida lake and an artificial channel, and that the Chemung reached the Susquehanna in less than another twenty miles and the Susquehanna continued south for many miles, crossing the whole of Pennsylvania and flowing into Chesapeake bay. When these natural streams were still sufficient for the needs of the navigation of the day, this short link between two such extensive chains was of great importance. Later, when the two canals across this divide came to be built, the States of New York and Pennsylvania had built also canals along the whole length of these natural watercourses.

There was a feeling too that the articles of commerce which were to be exchanged between the north and the south were of supreme importance. First there was the salt from central New York and then there was the coal from northern Pennsylvania, and this latter commodity has always furnished a cogent reason for canal construction. At one time, it is interesting to note, it was possible to start from New York harbor and go by canal boat through a long, circuitous, inland channel to Chesapeake bay, traveling along the course roughly described in the preceding paragraph. The route extended first northerly up the Hudson river, thence westerly through the Erie canal to the junction of the Cayuga and Seneca canal and then turning south through the latter canal it continued on southerly through Seneca lake and the Chemung and Junction canals to the

Pennsylvania line and then still continuing southerly it passed through the Pennsylvania canals and on into Chesapeake bay — a long journey of nearly eight hundred miles between these two portions of the Atlantic ocean and all of it far inland

We find that by 1815 there was sufficient interest in the prospective Chemung waterway to cause the incorporation of a private company to undertake the building of a canal from Seneca lake to the Chemung river at Elmira, or Newtown, as it was then called. Two years earlier a company had been formed for opening navigation between Seneca and Cayuga lakes and this contemplated improvement had made the proposed connection of the northern and southern waters even more desirable. Although the improvement between the lakes was made within a few years the company which was to build the canal to the Chemung valley never advanced their project to the stage of construction.

Disappointed in the hope of attaining their desires at the hands of the incorporated company, the people of this region petitioned the Legislature year after year, asking the State to undertake the work, and in 1825 this route was included in the "great canal law" as one of the seventeen surveys to be made. James Geddes, the man who had explored the route in 1812 and who had later won distinction as a chief engineer on the Erie and Champlain canals, made these seventeen surveys. His report advised building the canal and also the feeder, which would be almost as long as the canal itself. The State did not respond immediately to the appeals for this canal but by 1829 the advocates were successful and its construction was authorized. The law directed the canal commissioners to proceed with the building, provided they could complete the canal and the feeder at a cost not to exceed \$300,000.

The commissioners thereupon directed Holmes Hutchinson, another engineer of note on the early canals, to make detailed surveys and plans and later to take charge of the work of construction. It was Mr Hutchinson's boast later that he built the canal for less than his estimate and that the Chemung canal was the only one of the State waterways which did not cost more than the original estimates. His estimate was \$331,125.20 and the actual cost, \$314,395.51.

This care in husbanding the State's funds was highly commendable on the part of the engineer, but the parsimony of the State in dealing with this waterway was disastrous, not so much in first restricting the expenditure, that may have been the fault of the

promoters and the engineers in not daring to ask enough, but later, when the false economy of cheap construction was discovered, in again being niggardly, and all through the existence of the canal in doling out only enough to keep the channel in a barely navigable condition.

The first locks were built of wood and on too cheap a plan to remain stable. The canal was built between 1830 and 1833, but before 1840 the locks had become dilapidated. In 1841-43 they were rebuilt, still of wood, but according to a somewhat better plan, which, however, proved unsatisfactory, for much trouble was experienced by reason of the sides being pushed in by the weight of the earth and the action of frost. Then, in order to pass boats through these locks, the timber side walls had to be cut off or pushed back. By 1850 the locks again needed renewing and a structure partly of stone, known to the engineers of that day as a composite lock, was recommended. Shortly afterward the increased business on the canal, both existing and prospective, and especially the growing coal traffic led the friends of the waterway to advocate locks of a larger size, equal to those on the connecting branches of the State system, the Cayuga and Seneca and the Erie canals. Not till the winter of 1856-57 was the rebuilding commenced. Two composite locks were constructed but still of the old size. The cost of these was so much more than the money available that the remaining locks were again made of wood and the period of renewal was protracted through 1867. During much of the existence of the canal too there was experienced a serious lack of water-supply. On the other hand there were frequent floods and sometimes disastrous damages to canal banks and structures. The cause of these troubles of course was the nature of the territory, such as the character of the soil and forestation and the configuration of the hills and valleys. The run-off of the streams was what is known as "flashy." Storage of the waters would have corrected both the lack and the over-supply. Surveys were made for reservoirs, but the State made no provision for building them.

The early desire for waterway communication between New York and Pennsylvania was only partially met by the construction of the Chemung canal. To be sure it reached the Chemung river, a tributary of the Susquehanna, but the day when natural streams furnished ample means for navigation had long since passed and so there was still a gap between the two systems, the stretch of a little less than twenty miles from Elmira to the state line. The

people of the locality continued to appeal to the State for this connection and in 1839 they were reinforced by the Senate of Pennsylvania, which sent a committee to confer with New York State authorities concerning the building of a waterway from either the Chemung or the Chenango canals to connect with their system. Pennsylvania had begun a canal up the Susquehanna valley and it was then nearing the state line and therefore the people of that state too were solicitous for a joining link. The result of the conference was a survey and estimate along the Chemung valley route. During the preceding year, it may be said parenthetically, a survey had been made for extending the Chenango canal down the Susquehanna valley from Binghamton to this same point of junction with the Pennsylvania system and twenty-five years later this Chenango extension was begun.

The State did not follow this survey with the building of a canal to join the State systems, but in 1846 a private company was organized to undertake the work, which eventually it did, beginning the canal in 1853 and having it in operation throughout with junctions made in 1858. It is said that this venture proved successful for its stockholders until misfortune overtook its Pennsylvania connection, the North Branch canal. In 1865 a flood nearly destroyed the latter canal and although ineffectual attempts were made to repair the damage it was never opened again but was superseded by a railroad built along one of its banks in 1869. This caused the abandonment of the private canal in 1871. This waterway was called officially the Junction canal. Locally, from the name of its chief stockholder, it was known as the Arnot canal.

The State's portion of the canal between the northern and southern waters, the Chemung canal, was abandoned at the close of the 1878 navigation season. The immediate cause of this action was a general disaffection towards the canals, especially the smaller branches, by the people of the state at this particular time, and a determination to be rid of the majority of the lateral waterways. But back of that feeling there was present in the case of the Chemung canal the long story of an unfortunate State policy, the loss of waterway connection with the coal fields, the absorption of the coal traffic by the railroads, the disappointment in not securing a channel of ample size and the years of inadequate repairs and general dilapidation.

The survey for reopening this canal and making it a part of the Barge canal system was begun in May, 1913, and finished, with all

maps, computations and estimates made, in just about a year. In the tentative plans it was assumed that the channel and the locks would be of full Barge canal size. In general the line of the old waterway was followed, but in accordance with modern practice stream beds and the bottom of valleys were utilized rather than the side-hill locations of the early canals. From Elmira to the state line this practice was carried out to its ultimate extent and the channel was to be a river canalization. A long feeder, from Horseheads almost to Corning, to secure waters to be impounded on the upper Chemung river and its tributaries, was planned, just as a feeder in this same location had been needed for the old canal. Profiting by the experience of the early engineers, very careful investigations and computations for furnishing water were made and the needs of the canal and all available records of rain-fall and stream discharge were studied, in order to provide for an adequate supply. In this part of the investigation it was assumed that provision must be made for a canal with a capacity for two million tons seasonal traffic.

Briefly it may be said that the line of the proposed channel followed the valley of Catharine creek from Montour Falls to the divide near Horseheads. The reason for beginning at a point nearly three miles from the lake was that the stretch of abandoned canal between Watkins and Montour Falls had been reclaimed and again opened in 1887-9 and later, while the Cayuga and Seneca canal was being enlarged, its size had been increased and it had been adopted as a part of the Cayuga and Seneca branch of the Barge canal system. From Horseheads to Elmira the new line followed the valley of Newtown creek, diverging from the old canal route, which was on higher ground and passed through the center of the city. From Elmira to the state line it followed in general the channel of the Chemung river. Before it finally leaves New York state this river flows for about two miles through Pennsylvania in a loop to the south. As the ground in New York state north of this loop was not adapted to canal location the tentative plans contemplated continuance in the river channel even though it lay outside of the state. In connection with the feeder four storage reservoirs were planned. Dependence was not to be placed on the natural flow of the river, as had been done for the old canal. While this storage, if the canal had been built, would have been solely for necessary water-supply, the scheme would have rendered an incidental but most beneficent service to the community in lessening the height of floods. So too

would the enlarged channel and the structures in Chemung river and Newtown creek have helped to regulate those streams to the advantage of the adjoining territory.

According to the estimate the entire cost would have been \$26,662,372. The length, including the feeder, was 48.9 miles. Twenty-eight locks were planned, with an aggregate lift of 568 feet. The difference in elevation between the termini was 310 feet. The engineer made no report concerning the probable traffic on the proposed canal nor any recommendations as to the advisability of building it. In fact the law did not require him to consider either of these questions

Two attempts have been made to secure funds for reconstructing the Chemung canal. In 1914, as we have said, a bill including the Black River, the Chemung, the Glens Falls feeder and the Jamaica-Flushing projects passed the Assembly, but failed in the Senate. In 1916 a bill for the Chemung canal alone, proposing a bond issue of \$26,500,000, was introduced in the Assembly but never came to vote.

GLENS FALLS FEEDER CONVERSION

The next project to be reviewed is that of "converting the Glens Falls feeder into a canal." The language of the law is rather ambiguous. It would seem to imply that this feeder was not navigable. What was meant was the conversion of the feeder into a canal of Barge canal dimensions.

To understand the situation we must consider briefly the topography and a few historical facts. The old Champlain canal and the Hudson river ran parallel as far north as Fort Edward. There they separated, the river turning west and the canal continuing north toward the Lake Champlain watershed, which it reached after crossing a rather low divide between Fort Edward and Fort Ann. For years the Glens Falls feeder furnished this summit level of the canal with its needed supply of water. Starting at a dam in the Hudson just above Glens Falls, the feeder extends easterly for about seven miles and intersects the old canal near Hudson Falls. When the original Champlain canal was begun it was not thought necessary to construct this feeder, although there was some doubt even then as to the adequacy of the supply provided by other means and a survey to determine the feasibility of the feeder was made. But before the canal was completed, construction of the feeder had been started. Moreover, at the beginning it was provided with locks and made navigable for boats of the same size as those in use on the

original canal. The Champlain canal has had several lock enlargements. The feeder participated in the first of these, but not in the second — the enlargement which made the locks of the Champlain equal in size to those the Erie had before the increase in size to Barge canal dimensions.

Thus the beginning of the Barge canal improvement found the Glens Falls feeder a necessary adjunct for supplying water but of little value as a traffic feeder, for boats of only about 140 tons capacity, shorter and narrower than those in use on the main canal, could navigate its waters. The retention of this feeder, however, was contemplated by the plans for the Barge canal, since a summit level in the new canal in this same vicinity was still a necessity and the upper Hudson was the most convenient source of water-supply. But these plans did not provide for making in the feeder any changes which would increase its capacity as a cargo carrier.

The report of the survey of 1913 states that upon examination two possible routes presented themselves, one in the river channel and the other along the line of the existing feeder. Inasmuch as the bed of the river was rock, which would entail heavy costs in construction and also by interfering with water-powers would injure the very industries upon which the prospective canal must depend in large measure for its traffic, no estimates were made for the river channel route. At the eastern end of the line by way of the old feeder the course diverged away from the feeder and turned to the south, where a choice of three possible endings might be had, one by an entirely new route, one by way of the old Champlain canal and the other by the old canal and an old feeder. The first route was preferred by the engineer. The length of the proposed feeder by this line was 7.6 miles, the estimated cost, \$9,005,310, and the number of locks, ten. With the other endings the estimates were \$9,980,240 and \$10,004,287 and the lengths, 9 and 8.9 miles, respectively. The estimates were based on a channel and locks of Barge canal size. If the canal should stop at Glens Falls rather than extend a mile and a half farther to the feeder dam, each of the estimates would be decreased by \$1,400,000.

In his report the engineer gave not only the results of his survey and computations but also his conclusions from an investigation into the economic expediency of the project. Judged in the light of conditions then existing he considered that the small prospective tonnage would not warrant the construction of the canal. If, however, the State should adopt certain policies with reference to two

public questions, the business of this region might so increase as to make the canal advisable. One question was that of water-power development. Should a storage reservoir be built on the upper Hudson to regulate the flow and deliver an uninterrupted and dependable supply of power a very large increase in industrial output might naturally be expected. Also should the State adopt a policy toward the Adirondack forests similar to the national forestry policy and permit a well regulated cutting of trees, the industrial development of this section of the state would doubtless greatly increase. It was thought that sooner or later the State must adopt some such policy in its solution of the reforestation problem. The engineer considered that the three questions — canal, water-power and reforestation — must for this locality be considered as one.

The Glens Falls project was included in the omnibus canal bill of 1914, which, however, reached only to the stage of passage through the Assembly

JAMAICA BAY-FLUSHING BAY CANAL

The two other projects surveyed under the act of 1913 were both salt water canals, situated on Long Island and within the limits of the city of Greater New York. Unlike the three other waterways mentioned in this act these two proposed canals were neither connected directly with the State canal system nor lay along routes where any canal had ever been built. Because of their connections, their location within the confines of the great metropolis of America and also because of certain novel features, the reports on these prospective canals are unusually interesting. Their proximity to the ocean adds to the interest, for New York State has had but one experience with salt water canals, a waterway in the eastern portion of Long Island, known as the Shinnecock and Peconic canal and connecting Shinnecock bay and Great Peconic bay. In the report of these two surveys the projects are called the Jamaica Bay-Flushing Bay canal and the Newtown Creek-Flushing Bay canal. These names fit the broader scope of the schemes better than the more precise language of the law and we shall adopt them in our review.

For many years before this survey there had been a strong and persistent effort to secure the construction of a canal from Jamaica bay, which is on the ocean side of Long Island, to Flushing bay, which is an arm of Long Island sound near its junction with East river. From both the north and the south there are creeks extend-

ing toward the center of the island and along the valleys of some of these streams a suitable canal location might be found. This project was brought to the attention of the Barge Canal Terminal Commission, which was created in 1909. In the same year an act authorizing a survey of this route passed the Legislature but was vetoed by Governor Hughes on the ground that the object sought by the bill could receive proper consideration by this commission. But the commission had no funds for making such a survey and so it could do nothing. Again in 1910 a bill for this survey was introduced, and since the Governor had linked the Terminal Commission with the project, the members felt warranted in taking some action and accordingly they held a public hearing on the pending bill. At this hearing many representatives from commercial and business organizations were in attendance and all of them favored not only the bill but the construction of the canal as well, not an opposing voice being heard. The terminal commissioners, therefore, when the bill had passed and was in the Governor's hands, sent a letter to the Governor, telling of their approval of the proposed survey and setting forth its need if they were to reach an intelligent conclusion as to the desirability or even the feasibility of the canal. But the Governor again vetoed the bill. In their final report in 1911 the terminal commissioners recommended making this survey. In 1912 a bill to construct the canal was introduced but failed to pass. Then in 1913 came the act we are considering, the law authorizing the survey. But there had been estimates made before this time, probably, however, upon rather meager data. These were made by the authorities of the borough of Queens and were based on building a canal in a tunnel part of the way. Their figure was \$12,000,000.

To understand what was perhaps the most potent reason for advocating this canal, we must know that there was at this same time a project on foot to locate in Jamaica bay a large central terminal, which should have facilities so extended and so complete as virtually to make of this section of the city, divided from the Atlantic ocean as it was by only a narrow strip of land, what might be termed a great support of the port of New York. No project was being pressed with greater zeal and none had a larger array of endorsements from the commercial and trade organizations of the city than this Jamaica bay terminal scheme. The magnitude of the enterprise may be appreciated when it is known that the plans contemplated using the entire bay and its adjacent marsh lands for the proposed harbor development and the aggregate area of this territory was 28,870 acres, or 45½ square miles. It was considered that

the city, the State and the Federal governments would coöperate in producing this mighty terminal.

In traversing Long Island from Jamaica bay to Flushing bay salt marshes are encountered for the first two miles. Then comes a gently-sloping, sandy plain, varying in height from twenty to forty feet above mean high tide and extending for another two miles; next a steeper, irregular slope to the backbone of the island, a ridge which is composed of glacial drift and till and has a maximum elevation of a little more than a hundred feet; then a steep descent and lastly a level stretch of salt meadow situated in a deep indentation of the main ridge and extending about three and a half miles to Flushing bay.

Since each end of the proposed canal would open on an arm of the ocean, the question of tides and tidal currents had to be considered. Observations showed high tide occurring in Jamaica bay about three hours after low tide in Flushing bay and differences in elevation of from about four to six feet between the two bays at a given time. A sea-level canal with unregulated water-surface under these conditions would cause currents which would be detrimental to navigation and disastrous to the integrity of the channel. Accordingly a lock with double-acting gates was planned for each end of the canal.

Three types of canal were considered in the tentative planning. These were: (1) A sea-level, open-cut canal with two locks; (2) A high-level, open-cut canal with four or more locks; (3) A sea-level canal in a tunnel through the high portion of the island. Estimates were made for the first and third types. The second type would necessitate the pumping of water to the high levels and when investigation showed the enormous cost of such pumping this scheme was no longer considered. The sea-level, open-cut channel proved to be the cheapest to construct and in spite of its several objectionable features this was the type preferred by the engineer. The tunnel scheme on the other hand was more acceptable to the borough authorities and the owners of the affected property. This was because it would not disturb street plans and would obviate several bridges. But the cost was about one and two-thirds times that of the all open-cut type. The tunnel would contain a double conduit of reinforced concrete having channels of fifty feet width each with columns between the channels, which, because of the comparatively large ratio of cross-section of canal to that of the boat would permit a rapid and easy displacement of water by a moving boat. A channel and tunnel of the dimensions planned would permit

the meeting and passing of two boats of the largest size the Barge canal locks would accommodate.

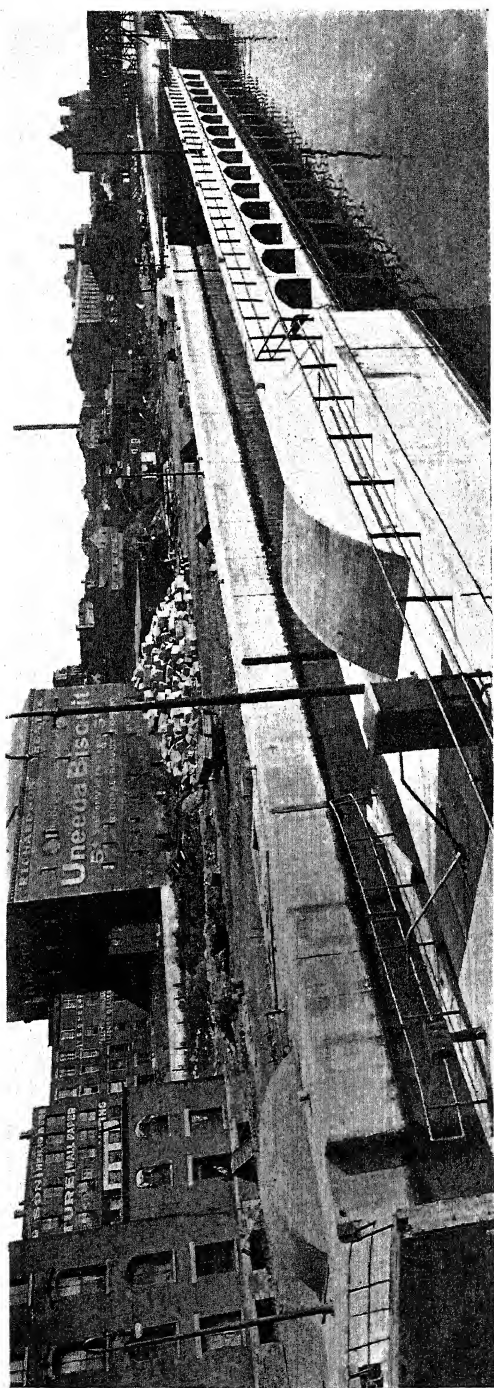
In making the estimate it was assumed that New York city would construct the channel and basins in Jamaica bay. Also the cost of work for a certain distance at the northerly end was estimated separately, since it was expected that the Federal government would improve the channel to this point. Standard Barge canal dimensions of both channel and locks were adopted for the proposed canal. The estimated cost of the canal according to the open-cut plan was \$13,211,042. If the tunnel were to be used the amount became \$20,956,476. The cost of the portion which the United States government was expected to build was \$618,468. Deducting this sum the estimates were \$12,592,574 and \$20,338,008, respectively.

The advantages claimed for this proposed canal were the saving of distance and the avoidance of congested channels and rough seas in transporting Barge canal cargoes from the Hudson to the Jamaica bay subport, also the creation of additional water-front, the reclamation of large areas of marsh land, the disposal of sewage and the linking of the Barge canal and the Hudson and East rivers with a proposed inland waterway along the south side of Long Island. In his report the engineer enumerates these claims and then points out that much of the benefit would be local rather than state-wide and that the saving in cost of carriage because of shortened distances would not compensate the State for the large expenditure. He concludes that a reason for constructing the canal must be sought in the indirect and local advantages rather than in such direct saving of time and cost of transportation as would benefit the whole state.

Attempts have been made twice to get legislative authorization for the Jamaica-Flushing canal. In 1914 a bill which included this and three other projects passed the Assembly but not the Senate. In 1920 a bill for this canal alone, carrying an appropriation of \$35,000,000, was introduced in both branches of the Legislature but never emerged from the committees.

NEWTOWN CREEK-FLUSHING BAY CANAL

Coming now to the second of the Long Island waterways, the Newtown Creek-Flushing Bay canal, we find a scheme which from time to time had been under consideration for more than a hundred years. Its purpose was to connect Newtown creek with Flushing bay by means of a channel cutting across the northwest corner of Long Island. The topography of the region is favorable, there being a creek valley on the west which extends inland to a central



Siphon lock at Oswego. At the junction of Barge canal and Lake Ontario navigation. The only siphon lock in America and the largest lock to which the siphon principle has been applied.

ridge, while on the east there is a similar stream valley and also a stretch of marsh land, both extending westerly to this dividing ridge, which is about three-quarters of a mile wide and from forty to fifty feet high and is composed of glacial drift.

The surveys of these possible routes determined a line by way of the marsh land which would run directly to Flushing bay, while by following the other easterly valley the line would intersect the route of the proposed Jamaica Bay-Flushing Bay canal and stop there, utilizing that waterway for further passage to Flushing bay. The latter route was the one chosen for estimate, since computations showed this to be the cheapest scheme and also the better in several other respects. But if this project had been considered as a separate enterprise and not in conjunction with the canal between Jamaica and Flushing bays, the marsh meadow route might have proved the more advantageous.

A sea-level canal was the only type considered for this project. Observations of tides showed that here too it was necessary to place a lock at each end of the waterway, but in this instance the lock planned for the north end of the Jamaica Bay-Flushing Bay canal would serve this canal also. The estimated cost, based on a channel and lock of Barge canal dimensions, was \$5,894,144.

Advocates for the project claimed that it would increase wharfage space, induce commercial development of the district traversed, provide for sewage disposal and furnish a channel by which the dangerous navigation of Hell Gate and East river might be avoided. These advantages, like those of the other Long Island project, were chiefly of a local character. So the engineer pointed out in his report and he added that the probable commerce would not be large. If the proposed canal should be looked upon as a Barge canal terminal and as such be considered a state-wide benefit, its cost for this purpose was excessive, since other near-by terminal sites, equally as good, were available and the saving in expense would be considerable.

The reports of the canal surveys of 1913 are contained in the annual report of the State Engineer for the same year, but in an abridged form they were transmitted to the Legislature as a special report on March 11, 1914. In the latter document State Engineer Bense! concludes with the following summary:

"A summary of cost of the five projects contained in the bill authorizing these surveys is as follows:

Extension of Black River canal.....	\$19,000,000
Reconstruction of Chemung canal (portion within New York state)	25,250,000
Conversion of Glens Falls feeder into a canal.	9,000,000
Construction of canal between Flushing river and Jamaica bay	20,338,008
Construction of canal from Newtown creek to junction with proposed canal between Flushing and Jamaica bays	5,894,144
	<hr/>
	\$79,482,152

"It is to be noted that in this summary the portion of the Chemung canal lying in the state of Pennsylvania is not included. The estimate for this is \$1,250,000.

"Also, the amount for the Jamaica Bay-Flushing Bay project is the estimate for the sea-level canal with a tunnel section. If the all open-cut type is desired, then \$12,592,574 should be substituted. Both of these figures are based on the assumption that the Federal government will construct the northern portion of this canal, which is estimated to cost \$618,468."

BARGE CANAL BRANCH, SENECA RIVER TO AUBURN

A few years later another attempt was made to add a branch to the State canal system. The Legislature of 1917 was induced to vote an appropriation for making a survey to extend the Barge canal to Auburn. The alignment of this proposed waterway, as set forth in the act, was to follow in general the outlet of Owasco lake between the city of Auburn and the village of Port Byron.

Auburn has never enjoyed the advantages of water transportation. In 1832 a private company was incorporated to connect it with the State system, but nothing ever came of this venture. The nearest point on the Erie canal was seven or eight miles away. In the early years, however, the city had the best of traffic facilities aside from water carriage. First, in the days of the stage coach, it was on one of the most important highways that crossed the state. Then, when the railroad came, following close to the highway, it still was on the most important artery of travel, the main line of the chief railway. But after the railroad straightened its course between Syracuse and Rochester, Auburn was side-tracked and was left on a minor branch. It is no wonder then that the people of this city, when a new avenue of commerce large with promise was coming so near to them, should want a branch of it to penetrate their borders.

Although the canal itself has not run through Auburn, the stream which flows through the city, the outlet of Owasco lake, has for many years been a feeder of the state waterway and the State has maintained a dam to make a canal reservoir of Owasco lake, which lies a few miles above the city. Some of the canal feeders have been made navigable, but this one never has. In effect, then, the scheme in question was to make this feeder navigable and to build it of sufficient size to allow the passage of such boats as should navigate the Barge canal.

Owasco outlet flows north in a fairly direct line from Owasco lake to Seneca river, passing through Auburn and Port Byron on its way. At the latter place it encountered the Erie canal, the old channel which has recently been superseded, and here its waters were diverted to feed that canal. At its mouth it now meets the new Erie, the Barge canal, which here lies in the bed of the canalized Seneca river. In the valley of this outlet lay the shortest and most natural route for a branch from the Barge canal to Auburn and under ordinary circumstances a survey for such a canal would have followed this stream to its mouth. The actual survey, however, after proceeding down the valley to Port Byron, turned sharply to the west and continued in that direction to the vicinity of Montezuma, where the line of the Barge canal was intersected. The reason for this was the crossing of two railroads, the West Shore and the New York Central, which a direct line would have necessitated. Such crossings would have been costly, much more costly than the short additional length required to reach the main line of the canal near Montezuma after it had itself crossed these railroads. Westerly from Port Byron the old canal alignment was followed for much of the way.

The proposed canal to Auburn was to be about twelve miles long and to have seven locks, five dams and from eight to ten bridges. The dams would have Taintor gate regulating sections and two of the locks were quite interesting in design—built tandem and of thirty feet lift each, or an aggregate of sixty feet at one location. Barge canal dimensions were assumed for both channel and locks. Along the Owasco outlet seven power rights were encountered and damages for these had to be included in the estimate. Also there was an item of considerable amount for providing an ample water-supply, which was to be done by making Owasco lake, the only practical source of supply, capable of impounding more water. As Auburn depends on this lake for its water-supply, sufficient for both canal and city had to be provided. The estimated cost of the canal,

including power rights, water-storage and all other items, was \$9,240,000.

A certain fact, which is mentioned only in an incidental way in the report on the Auburn survey, becomes somewhat illuminating when we stop to consider it. Perhaps it will explain why this proposed canal and indeed why all of the recently projected additions to the State system have failed to pass beyond the stage of preliminary survey. The report states that in determining the amount of water needed for operating the prospective canal to Auburn it was assumed that 500,000 tons of freight would be moved in a season. Now let us see what it would cost the State to move these half million tons of freight. At four and a half per cent, the rate of interest then prevailing on new State bonds, the annual interest on the estimated cost of the canal would be \$415,800. This would be eighty-three cents for each ton moved, or about seven cents per ton per mile, a sum at least ten times greater than the average rail rates before the war disturbed normal conditions, and nearly a hundred and forty times greater than the cost of transportation on the enlarged State canals as estimated by the committee which formulated the Barge canal policy in 1899. And thus far we have considered only interest on first cost, entirely neglecting weightier matters, such as repairs and operation and the sinking fund to liquidate the debt of construction. But we need not proceed; the partial calculation sufficiently illustrates our point.

During the legislative session of 1922 a somewhat feeble attempt was made to bring the authorization of this project to an issue. A bill carrying \$8,800,000 was introduced in both the Assembly and the Senate but it was never reported from the committees to which it was referred.

CANAL IMPROVEMENT, TONAWANDA-BUFFALO

The next proposition to review, while it contemplated an addition to the State canal system, differed widely from any of the proposed branches we have been considering. To be sure it looked toward the enlargement to Barge canal dimensions of the existing Erie canal between Tonawanda and Black Rock harbor, Buffalo, but its chief purpose was to provide at the western end of the Erie canal a channel both safe and suitable for boats plying on other parts of the Barge canal, should the route by way of the Niagara river — the route to be used under Barge canal plans — prove unsatisfactory. The Legislature of 1917 (by chapter 743) directed the State Engineer and the Superintendent of Public Works to investigate the two

routes and after studying the situation to report on certain specified topics.

The whole question hinged on the ability of Barge canal craft to navigate against the current in Niagara river. Since this stream carries the accumulated waters of four of the Great Lakes and since Niagara falls is situated eleven miles below Tonawanda, there exists a current of considerable strength, which is increased in velocity whenever there is high water in Lake Erie or when heavy storms from the west pile up the waters at the eastern end of the lake and drive them into the river channel. If, in order to enable barges to stem this current, it should become necessary to place in them an over-installation of power, more than that required to propel them at desired speeds through other sections of the Barge canal, then the cost of operation would be correspondingly higher and as a consequence freight rates would be increased. This question, therefore, was one of prime importance to Barge canal traffic. The old canal between Tonawanda and Black Rock harbor, it should be remembered, although paralleling the river, was a wholly independent channel and free from current.

State Engineer Williams and Superintendent of Public Works Wotherspoon found little existing data on the subject of currents in the Niagara river and so they were obliged to have observations made especially for their use. These showed a maximum velocity of 2.76 miles per hour. In their report the officials stated that such a velocity did not produce an impassable current against which to tow. Power insufficient to propel a power boat with a reasonable number of consorts at a speed of at least six miles an hour, they considered, was also insufficient for economical operation on the Barge canal.

Since they did not consider the current in Niagara river prohibitive of successful Barge canal navigation, they reported against enlarging the old canal to Barge canal dimension and substituting it for the river route. They did recommend, however, that the State should retain and operate this portion of the old canal. It would serve for the passage of small boats and also would be available, should future experience prove its enlargement advisable.

The act authorizing this investigation of routes between Tonawanda and Buffalo required that an estimate be made of the cost of improving the old canal from Tonawanda to Black Rock harbor. In compliance with this request the State officials submitted estimates on six propositions. These were: (1) High-level line from Tonawanda to Black Rock, estimated to cost \$6,252,507; (2) High-level

line from Tonawanda to Black Rock (differing from No. 1 in wall construction), estimated at \$6,121,798; (3) Low-level line from Tonawanda to Black Rock, estimated at \$7,211,130; (4) High-level line from Black Rock to Rattlesnake island (Niagara river remainder of distance to Tonawanda), estimated at \$3,195,675; (5) Low-level line from Black Rock to Rattlesnake island, estimated at \$3,619,563; (6) High-level line from Tonawanda to Black Rock, channel eight feet deep, not widened, two Barge canal locks, estimated at \$737,000.

The State has not as yet deemed it advisable to construct any of the seven proposed additions for which surveys have been made. In our review of these investigations we have not had much to say about the merits of the several projects. That is not the especial province of the present volume; rather its scope is confined chiefly within the field of history. And in the case of these particular schemes we are concerned more in viewing them as evidences of a general waterway movement than in knowing the pros and cons of each individual project. But to understand the history of past events and also to permit former experiences to serve us in solving the problems of the present, we must learn why things happened as they did. So now, without presuming to criticise any of the proposed additions to the State waterway system, we would simply say that the investigations did not seem to carry conviction, either to those in authority in State affairs or to the people in general, that the projects were economically sound or the needs were so great as to warrant more than preliminary examination. In explanation of this attitude we may repeat what we have already said, that there appears to be abroad a better appreciation of the principle that waterways, to be worth constructing, must connect large industrial centers or tap some source of extended natural supply. There is also a lesser principle, the value of which has been proved by experience in New York state, which teaches that unfavorable topography so adds to the cost of both original construction and maintenance that a canal is inadvisable unless the need is great and the prospect of remunerative traffic sufficient to overcome this disadvantage. A glance at the profiles of some of our abandoned canals reveals the excessive elevations they had to overcome by means of manifold locks and suggests one reason why these waterways were deemed failures. This latter principle would seem to apply to some of the recently proposed additions.

CHAPTER XX

COOPERATION WITH THE UNITED STATES IN ATTEMPTS TO ADD STILL OTHER BRANCHES

Jamaica Bay-Peconic Bay Canal: Early History: Physical Features: Arguments for Canal: Federal Activities: State Board Created and Directed to Make Examination: One Section Only to Be Examined. Two Earlier Attempts to Promote Scheme: Work and Findings of Board: Board Ordered to Continue Investigations: Second Report—Gravesend Bay-Jamaica Bay Canal: Board of Conference Appointed: State Prior to Federal Investigation: Discussion of Bridge Problem and Traffic Regulation: Opinions of Board as to Merits of Proposal: Outside Passage Considered Inadequate: Estimates and Recommendation: Value of Jamaica Bay as a Subport: Effect of Project on Barge Canal—Harlem River Improvement: Importance of Project: Tangle into Which It Had Fallen: Board of Conference Appointed: Physical Features of Improvement. Its Early History: Facts Brought Out in Investigations: Recommendations by Board: Subsequent State and City Action.

NOT only have there been these proposals for the State to extend its canal system, but also, since the beginning of Barge canal construction, efforts have been made to persuade the National government to construct canals or improve waterways of large dimensions within our state borders. There have been three recent projects of this character and we shall recount them in turn, noticing especially the part which New York has had in each. The sites of all three are in or near New York city and at least two of them, if constructed, will have more or less bearing on Barge canal traffic.

JAMAICA BAY-PECONIC BAY CANAL

The first in order of time is the Jamaica Bay-Peconic Bay canal project. To get at the beginning of this specific enterprise we must go back to the 1907 Rivers and Harbors Act of Congress, which authorized an examination in connection with the proposed canal.

But this was by no means the beginning of the idea of a canal along this route nor indeed was it the first survey. We find that as early as 1826 Holmes Hutchinson, a well-known canal engineer of whom we have already spoken, made a report to the canal com-

missioners on a proposed water communication extending farther than the project we are about to consider, even from Gravesend bay to Peconic bay, substantially the whole length of Long Island. Probably the idea of a canal along the whole or various parts of this route was current even in colonial days. In fact there is reference in at least one colonial manuscript to an act of crude canal making — the cutting of a channel from Shinnecock bay in 1652* Moreover, there is reason to believe that one short section of canal on the route we are discussing was built even prior to the advent of white men. The writer of a history of Long Island is authority for the statement that “traces still remain of the canal opened by Mongotucksee-Long Knife, Chief of the Mohawks.”† These traces were found on the site of what is known as the Shinnecock and Peconic canal, the only salt water canal of the State system, joining the waters of Shinnecock bay and Great Peconic bay, built by the State between 1884 and 1892.

Research shows also that in 1828 the Long Island Canal Company was incorporated with a capital of \$200,000 for the purpose of connecting Gravesend, Jamaica and Great South bays as far as Fire Island inlet. And again, in 1848, there was incorporated a second company, having a capital of \$300,000, the Long Island Canal and Navigation Company, its object being to connect Gravesend and Jamaica bays with Great South bay and also to cut a narrow neck of land across Long Island and enter into Peconic bay. So far as we can learn the former company never did anything towards constructing the canal, while the second company never went beyond making a survey.

The southern shore of Long Island fronts on the broad Atlantic and its many miles of coast would be severely beaten by the fierce storms that sweep across the leagues of ocean, had not the sea done what it sometimes does — built a barrier against its own violence. Back of this barrier, this comparatively narrow beach which the waters have piled up, lie bays and channels and islands and marsh meadows, and beyond them, sometimes at a distance of several miles from the beach where the ocean waves are rolling, is situated what may be considered the real shore of Long Island, although at certain localities rather large municipalities have been built on the narrow strips of beach. It is this favorable feature of topography which

* *The First Book of Records of the Town of Southampton*, p. 87. (Sag Harbor, 1874.) Page 105 of original manuscript record.

† *Early Long Island, A Colonial Study*, by Martha Bockée Flint, p. 40. (New York, 1896.)

has brought about the agitation for canals along the south coast of the island. The possibility of building short stretches of artificial channel to connect long reaches of open navigation, all of it protected from the storms of the ocean, has been a bright prospect to lure man's endeavor.

Briefly we may mention the natural bodies of water which a canal clear across the southern shore of Long Island would traverse. At the western end adjoining the Narrows, which connects Upper and Lower New York bays, lies Gravesend bay. Proceeding thence easterly we pass first over low land behind Coney Island, on through Sheepshead bay and other channels and marsh land into Jamaica bay, which lies back of Rockaway beach. Next comes the highest land we encounter, known as Rockaway ridge. Beyond this there are some ten miles of small bays, channels and marsh meadows before we reach first South Oyster bay and then Great South bay. This latter bay stretches for nearly thirty miles and is followed by Moriches and Shinnecock bays with small bays or channels between the three large bays. At its eastern end Long Island forks into two long, broad peninsulas, widely separated. Between Shinnecock bay on the south shore and Great Peconic bay, which lies between the forks of the island, there is a low, narrow neck of land, which we have mentioned as the place where the Indian chief is said to have opened a canal. Thus the Jamaica-Peconic project, which we are now considering, together with the Gravesend-Jamaica scheme, which we shall take up next, encompassed the whole plan of waterways along the south coast of Long Island.

We may pause for a moment and consider why the people of Long Island wanted a canal along the southern coast, glancing briefly at the arguments they advanced at the time of the recent investigations. The saving in freight costs and the development of the region along several lines of progress are chief among the reasons.

It was said that the canal would carry from 500,000 to 700,000 tons of freight, on which there would be a probable saving of \$350,000, and this tonnage would increase with the industrial development that might be expected. By way of produce it was noted that Suffolk county had some of the most productive farms and market gardens in the state, potatoes and cauliflower furnishing the largest crops, the latter product being grown in greater quantity there than in all the rest of the state and requiring for three months of the year special trains of from eighteen to twenty-five cars a day to carry it to market. That much of the southern part of the island might be turned into gardens, close to the great New York market, was the

hope of the people, and to bring in immense quantities of fertilizer and to carry out the many times greater amounts of produce a cheaper means of transportation was needed. Then there were industries which must be carried on adjacent to the proposed canal and which without it were handicapped by long hauls to the railroads. These were the oyster and fish industries and the raising of ducks. All of them were already large and would grow rapidly with favorable shipping facilities.

The increased valuations in realty that would follow the development of the region were estimated as sufficient to pay the whole cost of constructing the canal. One feature of this contemplated increase in land values was the use for summer residences of the beach which fronts directly upon the ocean. For sixty miles this was virtually unused, except at three or four places where boats or bridges gave access, and the direction of the prevailing winds makes it more desirable than any beach along the New Jersey shore. This neck of land is from a quarter to three-quarters of a mile wide and behind it lie the bodies of water which it was proposed to canalize. Along these bays and creeks there is an additional water frontage of 250 miles. Water communication was needed to render these localities easily accessible.

Still another argument was the value such a canal would have as an instrument for military defense. In the event of hostile attack New York city of course would be the prize most eagerly sought and a waterway along more than a hundred miles of the approach to the city would be of untold advantage, it was pointed out, in preventing its capture. It would pass the smaller types of war vessels, including torpedo boat destroyers, submarines and the like, and would accommodate floating batteries carrying guns of large caliber.

Latterly there has entered a new element into the desire for at least one portion of the proposed canal along the south shore. This is the plan of creating in Jamaica bay a huge waterway terminal, a veritable subport of the port of New York. As we have said, this plan lay at the bottom of the attempt to get the State to build a canal across the breadth of Long Island from Jamaica bay to Flushing bay. Failing in this undertaking, the advocates, as we shall see a little later, essayed to induce the United States to open an inside passage by way of Gravesend bay.

Reverting to the act of Congress in authorizing an examination of the Jamaica-Peconic project in 1907, we notice that under this act the United States district engineer made a report which contemplated the construction of a canal 100 feet wide and six feet deep. The

Board of Army Engineers concurred in this report, but on resolution of the Committee on Rivers and Harbors of the House of Representatives a reexamination of the report was made by the Board of Engineers and as a result it was concluded that a more detailed investigation into the cost of building this canal was warranted. In 1909 an appropriation was made by Congress for a survey and estimate and in 1914 the district engineer submitted his report on this survey. It was not favorable to the proposed construction, but the Board of Engineers, after careful consideration, referred the proposition to the district engineer again, directing him to ascertain to what extent the State of New York and the municipalities along the line of the prospective canal would coöperate in its construction. In 1915 a hearing was held before the district engineer, at which it was brought out that all lands required for what was known as the first section of the waterway, the westerly four and one-half miles, must be deeded to the United States free of cost. At this hearing also the district engineer was promised that a bill would be introduced in the New York Legislature to provide for an appropriation of \$995,000 to cover the State's share in constructing the canal. Thereupon the district engineer made a favorable report on the project to the Chief of Engineers, U. S. Army, recommending, however, that the Federal government should construct only the main line of the canal, leaving the building of lateral branches, the furnishing of right of way and the construction of bridges for the State and the municipalities to provide for.

This report of the district engineer was in the hands of the Board of Engineers, awaiting determination by the State as to the extent of its coöperation, when the Legislature of 1917 (by chapter 317) created the Jamaica Bay-Peconic Bay Canal Board and directed its members to confer with the United States officials concerning the construction of the proposed canal on the south side of Long Island. The act appointed as members of this new board the State Engineer, Frank M. Williams, who was to act as chairman, the Superintendent of Public Works, W. W. Wotherspoon, and one other, to be named by the Governor. This third member was Joseph E. Bailey of Patchogue, Long Island. In addition to commissioning this board to confer with the Federal authorities the act directed the State Engineer to determine the cost of building the necessary bridges and also of furnishing the required right of way for the proposed canal. It also ordered the State to proceed with its share of the undertaking after the Federal government should have set aside funds for the project, provided the estimate of cost for bridges and

right of way should be not more than \$1,000,000, thus in effect stipulating that the State would not consider any cooperation beyond that amount. Another proviso was that the channel constructed by the Federal government should be at least twelve feet deep.

In making his report in 1914 the district engineer had divided the whole line of the canal into four sections, the aggregate length of which was $76\frac{1}{2}$ miles. The first section, $4\frac{1}{2}$ miles long, crossed the elevation of land known as Rockaway ridge and here occurred the most serious difficulties in securing proper alignment, since this region had been somewhat built up and the property traversed was of considerable value and the streets or railroads intersected would require bridges. The remaining three sections on the other hand involved the construction of the canal within what may be termed navigable waters and presented no difficult problems either as to alignment, the acquisition of property or the building of bridges. So far as cooperation went New York State was concerned only with the first section of the canal and the newly-created Canal Board confined its investigations to this region. The district engineer had considered several routes within this section and the routes now examined by the State board were but modifications of those he had mentioned in his report of 1914.

Recurring for a moment to the promise given at the hearing in 1915, that a bill would be introduced in the New York Legislature to provide for an appropriation of \$995,000 for the State's share toward the canal, we observe that such a bill was introduced at the 1915 session, but as this was the time when the measure for authorizing an additional bond issue of \$27,000,000 to complete the Barge canal was being brought to public attention, it was thought best to let the Long Island project wait for a year. In the fall of 1915 the State Waterways Association at its annual convention directed a committee to push the proposed legislation. The members of this committee conferred with State Engineer Williams and as a result he made a report to the Legislature recommending that the State cooperate with the Federal authorities, provided the United States would construct a waterway of Barge canal dimensions. A bill embodying this idea was then introduced, in which the extent of State assistance was limited to \$995,000. The committee had high hopes of a successful issue, especially as the Governor had accompanied the State Engineer on his trip of inspection over the route and seemed more than favorable. The whole project appeared most promising; for the expenditure of only a million dollars the State was evidently on the eve of securing an addition of nearly eighty

miles to its canal system. But opposition developed, from both the Governor and the Legislature, and the bill was never reported out of committee. During the 1917 session, however, as we have seen, a similar bill became law.

We do not need to go deeply into the activities of the newly-appointed State board. It did the work required of it and reported to the Legislature under date of December 27, 1918. The estimates it submitted were along three routes, called the Woodmere, the Hewlett and the Far Rockaway routes. Also three separate estimates had been made for each route, these being based on the prices that prevailed at three periods of time—before the war, in January, 1918, and in January, 1919. There were twenty-one estimates in all and they ranged from \$660,000 to \$1,900,000, according to the route, the prices used and the possible elimination of certain bridges.

In reporting the conclusions to which it had come the Board placed itself on record as favoring the extension of the inland waterways system of the State. It stated that, if the United States would construct the proposed canal, excavating to a depth of twelve feet and making its other dimensions correspond substantially with those of the Barge canal, so that the waterway might be considered as an adjunct to the State system, then in the opinion of the Board the State was justified in cooperating to the extent of a million dollars. The cost of building the bridges and acquiring the right of way would depend in large measure on the attitude of the residents in the communities that would be served by the prospective canal. If they should be reasonable in their demands, asking only a fair price for the lands which the State must purchase and not exacting an excessive number of bridges, the State's portion of the cost, the Board thought, could be kept within the million dollars.

There were two particular statements in this report which we must examine in detail, since they gave rise to subsequent legislative action. The Board mentioned a fourth route, the Lynbrook (not included in the district engineer's report), which it had considered but had not investigated with the same care as the other routes. It reported also that one of the lines ran near some fresh-water wells, which were owned by the Queens County Water Company and yielded the supply of water that this company distributed to the neighboring communities. In its estimates of cost the Board had not included any sum for damages which might be sustained by reason of opening a salt-water channel near these fresh-water wells. The report stated, in fact, that the Board had not been able to conduct the exhaustive investigation necessary definitely to determine to what extent, if any, these wells would be damaged by the proposed canal.

In order to get information on the two questions left thus unanswered by this first report, the Legislature of 1919 (by chapter 15) ordered the Board to continue its investigations, specifically directing it to examine the Lynbrook route and to determine what effect the construction of the canal would have upon the source of fresh-water supply.

The second report of this Board, presented to the Legislature on February 11, 1920, was not in a hopeful vein. To the two questions of special inquiry it made definite answer, but in each case the prospective expenditure devolving upon the State was not favorable for the consummation of the project. For the Lynbrook route the report submitted twelve estimates and on the problem of salt water from the proposed canal penetrating to the wells of the Water Company it contained the opinions of a water-supply expert and of the Attorney-General on the physical and legal aspects, respectively, of the subject.

In estimating for the new route six conditions as to the number of bridges were assumed. Also two sets of prices were used, pre-war prices and those prevailing in January, 1920. The six estimates based on pre-war prices ranged from \$870,000 to \$1,226,000, while the six computed on January, 1920, prices ran from \$1,094,000 to \$1,675,000. The water-supply expert reported his conviction that sooner or later salt water would reach at least a portion of the wells of the Water Company, if the canal were built on the Lynbrook route, and that the adverse effect would be immediate, should the canal follow the Hewlett route. The Attorney-General, asked by the Board for an opinion, answered that he had come to the conclusion that "the Board should proceed upon the assumption that the State would be held answerable for the damages resulting from rendering brackish the subterranean waters which feed the well in question." The Board did not attempt to estimate the amount of this possible liability, but, to show that it might be a considerable sum, simply quoted a value set in 1915 by one of the New York city departments when there was some thought that the city might acquire the property of this Water Company. That estimate was substantially \$1,700,000.

In concluding its report the Board deprecated its inability to say that the cost to the State for bridges and right of way on any of the routes examined would be less than a million dollars. In its first report the hope of keeping within that limit had been expressed, but now, because of increased costs, due to war conditions, and also because of the unwillingness of property owners to dedicate their lands, even the possibility of such hope had departed.

GRAVESEND BAY—JAMAICA BAY CANAL

The second project proposed for construction by the National government, with cooperation from New York State, was a waterway between Gravesend bay and Jamaica bay. In a broad sense this was simply a portion of the canal which had long been desired across the southern border of Long Island, but, because of recent endeavors to make Jamaica bay a most important part of the port of New York, it had become something more. It was now a scheme which stood out prominently by itself, apart from the rest of the enterprise; it had its own peculiar merits and these demanded for it consideration as a separate undertaking.

One evidence of the long-standing and firm belief in an eventual canal along this route is found in the fact that in 1864 a body known as the Kings County Land Commission, appointed to lay out a system of streets in Kings county, now the borough of Brooklyn, laid out a proposed ship canal 200 feet wide along Coney Island creek, which ran from Gravesend bay to Sheepshead bay (a part of Jamaica bay) and paralleled it with marginal streets, each a hundred feet wide and called North and South Canal avenues.

The State's share in the recent attempt to open a canal on this route began with the appointment of a body of men, known as a Board of Conference, by the Legislature of 1919 (chapter 585). This board consisted of the State Engineer, Frank M. Williams, chairman, the Superintendent of Public Works, Edward S. Walsh, and the Commissioner of Docks of New York city, Murray Hulbert.

Unlike the investigation of the route from Jamaica bay to Peconic bay, which had been examined and reported upon by the United States engineers before the State took a hand in the affair, the task set this Board of Conference was one which preceded any authorized action on the part of the Federal authorities. Before finishing its work, however, the Board was able to say that the United States engineer of the district had reported to the War Department favorably on making a survey of the proposed canal and had been instructed to proceed with this survey as soon as convenient.

Assuming that the United States would not undertake this canal unless the usual conditions were met, the same conditions as those mentioned in the discussion of the Jamaica-Peconic project, the Board of Conference made an estimate of the cost of furnishing right of way and building bridges for the proposed waterway. A canal connecting Gravesend and Jamaica bays would of necessity cut

Coney Island off from the rest of Long Island and this situation would demand bridges. Whether this area was originally a real island is uncertain, but until recent years there was a channel from Gravesend bay to Sheepshead bay that was navigable for very small boats, and this still exists as a narrow and tortuous waterway, called Coney Island creek, spanned by several low bridges. A large territory on the north side of Coney Island, which formerly was low-lying and poorly drained, had been filled in and made habitable.

To excavate a channel four hundred feet wide and thus to make Coney Island actually an island, cutting off its many people from unimpeded passage to the north, made the subject of bridges across the proposed canal a most momentous question. Travel here was always large and sometimes enormous. Those who crossed the proposed route daily the year round numbered thousands and in the summer months frequently hundreds of thousands of persons visited Coney Island in a single day, coming by surface, elevated and subway cars, taxicabs, automobiles and other vehicles. This traffic was not problematic but actual and it had rights which could not be abrogated nor even neglected.

On the other hand, if this canal should be built and the proposed terminal development of Jamaica bay should become an accomplished fact, and these two projects were so interdependent as to be really a single scheme, then it was essential that navigation throughout the length of the canal should be as free and uninterrupted as possible. Jamaica bay would be a very important part of the port of New York, but nevertheless it would be only a part of the port and would be dependent on the other parts as they in turn would be dependent on it. Therefore this connection should be complete and practically continuous in operation, for any delay suffered by ships in loading or discharging cargoes at the wharves or by the industries relying on the commerce of the canal would result eventually in a charge against the consumer and moreover it would become a tax on the commerce of the port which would tend to divert business to other ports.

In making provision for bridges there were, then, the interests of these two groups to consider — those who crossed the canal and those who navigated the canal, and the interests of the latter class, through the ramifications of business and industry, touched substantially the whole public. Also two other interests had to be taken into account. If the Federal government were to construct the channel, then the requirements of the War Department must be observed. And in addition the interests of bridge owners should

be weighed. The Board of Conference judged, however, that these several interests did not conflict so seriously as to prevent adjustment and they considered that by complying with the Federal requirements and establishing equitable regulation of land and water traffic, the problem might be solved with justice to all concerned.

The requirements of the War Department were that bridges should be of some type which would give unlimited headroom when open, that they give clear headroom when closed of at least 24 feet above mean spring flood tide and that the clear horizontal opening be at least 100 feet for a single opening, such as a bascule bridge would furnish, or 70 feet for each of two parallel openings, such as a swing bridge would provide. In making estimates for bridges the Board selected the bascule type and planned for structures which would comply with these Federal specifications — a headroom when closed of 24 feet and a horizontal opening when open of 100 feet with unlimited headroom. Whether or not the United States should construct the canal, the Board considered that it would be best to conform to the War Department requirements.

For regulating the traffic the Board thought that a scheme of operation patterned after that of the Harlem river should be adopted. It was, in fact, the harmony attained between bridge and channel traffic on the Harlem river which guided the Board in its present recommendations, leading it to believe that an equally accordant plan might be formulated for the proposed Gravesend-Jamaica canal. In a recent year the channel of the Harlem had carried a tonnage equal to one-third that of the entire foreign commerce of the port of New York and at the same time millions of persons and hundred of thousands of vehicles had crossed the river. The regulations under which the bridges on the Harlem were operated provided for keeping them closed during certain hours each day, the hours of maximum traffic across the river being selected. Not all channel traffic was stopped by this arrangement, since the headroom when the bridges were closed, in some cases somewhat less than 24 feet, was enough to permit navigation by small tugs and unrigged craft at all times. The Board in its report did not attempt to lay down a definite plan of regulation for the proposed waterway, but simply stated its firm belief that upon a detailed study of traffic an operating plan might be predicated which would safeguard the city's large investment in subway and other lines as well as the interests of corporate transit lines and at the same time adequately foster all the various kinds of legitimate traffic.

Concerning the merits of the proposal to build this canal the Board of Conference had some clear-cut and well-considered opinions, and to these it gave free expression in its report. Jamaica bay, it thought, was one of the most suitable localities for development on the New York state side of the port of New York, and this development might with profit be along the lines of either commerce or industry, or both. But in any case the development was contingent on communication with the other portions of New York harbor. If the location had been far enough away, this terminal could be developed like any other independent harbor, but being in Greater New York, it was subject to the conditions which existed in that port. As we have said previously, the various parts of the port were unusually interdependent, perhaps more so than in any other harbor.

Since, therefore, intercommunication was an indispensable requisite, it was essential that efficient means of transit be at hand. There were three possible methods—by rail, by water and by dray. Rail communication with the remainder of the harbor was decidedly unsatisfactory except with Brooklyn and perhaps with the Bronx. The only available rail route for freight to Manhattan was the long and circuitous course by way of Spuyten Duyvil and the Hell Gate bridge. Since the Pennsylvania and Long Island tubes were practically closed to the transportation of freight, there was no rail connection whatever with Staten Island or any portion of the harbor west of the Hudson river except by car-float, and this procedure, of course, transferred the method from rail to water communication. To depend on drays or various kinds of trucks for connection with other harbor points was out of the question. Jamaica bay was too far removed from most of these points to make such form of communication practicable, even if the avenues for its use had been fully available.

The logic of the situation, therefore, demanded a water connection with the remainder of the harbor that would be safe at all times of the year. To be sure there was already ample communication by water, but, as we shall see presently, this route had the menace of severe storms through much of the year. If Jamaica bay were to be developed industrially, there must be means for bringing in materials and sending out products both to the rest of the port and to its connecting waterways. If the bay were to be developed commercially and to become the great terminal which had been planned, safe water communication was still more essential, even indispensable to the success of the project.

The same practices would necessarily prevail in Jamaica bay as in other parts of the port and there would ensue an extensive use of lighters. By reason of physical conditions the port of New York had become essentially a lighter port, that is, a large portion of the freight was moved within it from point to point in lighters, barges and other harbor craft. To question whether this was the most economical practice was entirely beside the point; the condition existed and had to be met. Authorities who had investigated the leading ports of the world claimed, however, that this custom was beneficial to the port of New York and should be perpetuated in large degree. It was a fact that few ocean cargoes were either loaded or discharged at this port without some part of them being borne by lighters, and this must be the case also with steamship cargoes to and from Jamaica bay. It was imperative for its development, therefore, that a safe passage to it for small craft be available all the year round.

The existing water route to Jamaica bay was an outside passage, south of Coney Island and thence through Rockaway inlet. There was a Federal project on foot to improve the channel in this inlet. From testimony adduced at a hearing at Coney Island and from such other information as the Board was able to gather it appeared that, while the outside passage might be safe during most of the summer and parts of the spring and fall and for a few days in winter, it was very far from being safe at all times and was positively unsafe during a large part of the year for all but the larger craft. There was a probability that in the course of time this route might by natural processes be made as safe as an inside passage. Rockaway beach was constantly being extended toward the southwest, thus gradually approaching Sandy Hook. How long it would take to extend this peninsula to such a point that in conjunction with Sandy Hook it would give adequate protection at all seasons to small craft passing to and from Jamaica bay no one could tell, but at the existing rate of accretion it was estimated the process would require from fifty to a hundred years. This, the Board thought, was too long to wait, since the cost of the canal could be written off in benefits years before this period should have elapsed.

The State Engineer through his corps of engineers surveyed and mapped the route of the proposed canal and estimated the cost of erecting necessary bridges to be \$9,500,000. The Superintendent of Public Works caused an appraisal of right of way to be made. This amounted to \$882,910.20. In its report to the Legislature the Board stated that in its opinion the interests of navigation and com-

merce not only warranted but made desirable the construction of this canal between Gravesend and Jamaica bays and it recommended that the State cooperate to the extent of providing the necessary right of way. The channel proposed by the Board was to be at least 250 feet wide at bottom with sloping sides or 400 feet wide with vertical sides and was to have at least 15 feet depth of water at mean low tide. A right of way 400 feet wide was to be provided.

In this account of the Gravesend-Jamaica project we have said but little concerning the necessity of adding Jamaica bay to the port facilities of New York city. The Board of Conference itself said almost nothing on this subject — possibly because the congestion of the port was so patent as to need no comment. The port of New York in both the volume and the value of its commerce exceeds all other ports of the world. Just about half of the foreign commerce of the United States passes through this port. So far as natural facilities go it is most admirably situated to handle not only its present but a much more vast trade, the land areas being so surrounded and divided by navigable waters as to give almost ideal conditions for water transportation. The whole port, that is, the area within the customs limits, which embrace in large part the New Jersey shore opposite New York, has a total water front on rivers, bay, sound and ocean of 444 miles. But with all its natural advantages the port is notoriously deficient in terminal and docking facilities. And for many years the acuteness of this condition has been growing; in spite of inadequate wharfage, commerce has increased amazingly, while accommodations have been added but meagerly. It is easy to see, then, why the Jamaica bay scheme, with its 45½ square miles of land and water area to develop into a mighty terminal, was so well thought of by those in quest of a solution for New York's transportation problems and had become so popular with the shipping public in general.

There is another phase of the Gravesend-Jamaica proposal which we have not mentioned — the effect such a canal might have upon Barge canal traffic. If the Jamaica terminal plan should be developed, the boats plying on the State canals should by some means be enabled to reach this portion of the port without hindrance or delay. The outside passage could not guarantee this necessity. But of course the Jamaica terminal project is so dependent on the construction of some inside passage that it goes hand in hand with the Gravesend-Jamaica canal, the Jamaica-Flushing scheme or other like proposition. Should these proposals come to fruition, therefore, it is plain that the Barge canal would have a considerable share in the benefits that are expected to ensue.

HARLEM RIVER IMPROVEMENT

The third of the enterprises for waterway improvement within New York state was that for bettering navigation on the Harlem river. This was not a new undertaking; it had long been a Federal project, having been adopted by act of Congress in 1874. Although the State had thus not had a direct part in making the improvements, its cooperation was required in furnishing certain right of way and its interests were involved in several particulars. In the first place the traffic on the Harlem was enormous and doubtless would increase many fold with the completion of the improvements. While this commerce affected New York city primarily, it was of considerable importance to the whole state. Then too, notwithstanding the already available route around the south end of Manhattan and up East river, a short, safe, uncongested channel from the Hudson to East river might open to Barge canal traffic many markets in Bronx and Queens boroughs which otherwise would remain closed. As this region is large and important its active participation might notably augment canal traffic. And again, the construction of the proposed canal terminal at East 136th street was contingent by law upon the improvement under Federal authority of the Bronx kills, a project which could not advance until various conditions on the Harlem had been met.

The participation by the State in the Harlem project at this time was prompted chiefly by two circumstances. First, there was the same desire for waterway improvement and an extension of Barge canal benefits which had given rise to the nine other enterprises we have just been discussing, and this desire by the way was but a part of a wide-spread waterway agitation abroad in the land. Then, this particular project had become so involved, each part in turn so dependent for advancement upon some other part, that all progress had been blocked and any endeavor to proceed had been but to work in a circle. In large measure for the purpose of straightening out this tangle, the Legislature of 1919 (by chapter 586) appointed a board which should study the whole situation carefully and report its findings to the succeeding Legislature. This body, too, was called a Board of Conference and it consisted of the same men as those who made up the Board of Conference in the Gravesend-Jamaica canal. The State Engineer, Frank M. Williams, was chairman, and the Superintendent of Public Works, Edward S. Walsh, and the Commissioner of Docks of New York city, Murray Hulbert, were the other members. There were three particular features of the Harlem project which demanded the attention of the Board. These were the

straightening of the channel at an especially objectionable bend, the removal or alteration of High bridge and the widening and deepening of the Bronx kills. It will be recalled that the Barge Canal Terminal Commission had made recommendations concerning all of these three questions in its final report in 1911.

The Harlem river is the tidal waterway which separates Manhattan island along its northeast border from the mainland. At Kingsbridge it joins Spuyten Duyvil creek, another tidal waterway, which completes the separation of the island, extending along its extreme northern end. These two streams have a combined length of about eight miles. At the southeastern end of the Harlem river and connecting it with the East river is what is known as the Bronx kills, sometimes called the Harlem kills, a shallow and much-obstructed waterway about 4,000 feet in length, which lies between Randall island and the mainland. About midway in its course the Harlem river is spanned by High bridge. This structure was completed in 1848, a part of the Croton aqueduct improvement, and for years it carried the Croton waters at a height of a little more than a hundred feet above the Harlem river across to what was then the city of New York.

It was this short-cut channel, by way of Spuyten Duyvil creek, Harlem river and the Bronx kills, which the advocates of the scheme wanted improved, in order that there might be adequate passage between the Hudson and East rivers without going down around the Battery and back again, a distance of about twenty-five miles through a congested, in some places tortuous and not always entirely safe course. This improvement would benefit directly the east waterfront of the borough of Bronx and the portion of Queens borough lying along East river and Long Island sound, a region which had been among the first in the state in rate of recent development.

So much for the geography of the project; now a little concerning its history. Reviewing the events prior to the time of the Board's activities we learn that after the Harlem had been improved under the act of 1874 Congress adopted a new project in 1878 and this was modified in 1879, in 1886 and in 1893, and enlarged by the rivers and harbors act of 1913. The existing project, which was under the authority of the 1913 act, provided for a channel 400 feet wide and 15 feet deep at mean low water from the East river to the Hudson river, except that at two points the width was somewhat lessened. The estimated cost of this project, as revised in 1913, exclusive of the amounts spent on previous projects, was \$3,550,000. It was said that about 58 per cent of this work had been

done at this time, a full-sized channel having been excavated part of the way and a full depth of 15 feet having been made through the whole length, except at one bridge. The chief remaining obstructions, aside from the partial widths, were High bridge and the place where the channel was to be straightened.

The account of the Bronx kills project shows that in compliance with an act of Congress in 1881 a survey and report were made, the estimates being for a channel 300 feet wide and 12, 15 and 18 feet deep, respectively. Another report was submitted in 1896, with revised estimates, on a channel 300 feet wide and 15 feet deep. In 1897 a third report was made and this contained estimates for a channel of the same width but with depths of 18 and 20 feet, respectively. Yet another report was submitted, in 1902, and the estimates in this were based on a channel 300 feet wide and 18 and 20 feet deep, to cost \$1,899,480 and \$2,514,600, respectively. The Board of Engineers advised the carrying out of this project in accordance with the 18-foot estimate of the latter report; the Chief of Engineers concurred and the Secretary of War transmitted the report and the subsequent actions and concurrence to Congress. There the matter rested till 1915, when it was again brought up in the Rivers and Harbors Committee, and in 1916 Congress authorized a resurvey. This the Secretary of War ordered and work was begun, but the World war prevented its completion, just as it stopped most domestic projects. But a resurvey was being completed as the Board of Conference undertook its task. A report on this survey had not been submitted when the Board made its report to the Legislature, but of one thing the Board was assured—that the War Department would not recommend the improvement of the Bronx kills until the obstructions at High bridge had been removed.

The United States, the State and the city of New York all had a part in the entanglement into which the project as a whole had fallen. A few words will explain the situation. The Barge canal terminal act made the construction of a terminal at the foot of East 136th street, East river, Bronx borough, dependent on the deepening of the Bronx kills by the Federal government. The improvement of the Bronx kills was an affair wholly within the province of National authority, except possibly the ceding of a little land by the State, a detail of easy adjustment, but the Federal government seemed to have determined as a matter of policy that, even if this project were adopted by Congress, no part of the appropriation should become available until the pillars of High bridge ceased to obstruct navigation. This structure belonged to the city and its removal or

alteration was a task for which the city alone was responsible. But the municipal authorities had assumed the position that they would take steps to remove this obstruction only upon the condition that the objectionable bend in Spuyten Duyvil creek should be eliminated. Congress had authorized the War Department to straighten the channel at this place when the State or other parties should have provided the necessary right of way. Shortly after Congress had adopted this project, March 4, 1913, the State attempted to comply with this requirement by enacting a law (chapter 414, Laws of 1913), but unfortunately for the project certain conditions were inserted which made the carrying out of the act impossible.

This was the situation which confronted the Board of Conference when it assumed office, and, as we have said, its task in part was to devise means for untangling the knotted problems. As the string of provisos seemed to end with certain required action on the part of the State, it appeared to be the duty of the State to make the first move, and the appointment of this Board was in response to such demand. If neither the United States nor the city would recede from its stand, the State was in position, of course, to set the chain of activities in motion by furnishing the desired right of way, but this action was fraught with several difficulties. The land was occupied by a large industrial plant, the Johnson Iron Works, and to remove it or to change it not only would entail large expense but might result in creating conditions which were not at all to be desired. The law, as it stood, limited the State expenditure to one million dollars, and this amount was insufficient to obtain the right of way. Also there was but little general knowledge on the subject and not enough appreciation of the need of the improvement to create public demand for adequate action on the part of the State; hence the Board of Conference and its task of gathering information, of stimulating general interest and of inspiring to action, if possible.

In its study of the Harlem project the Board made trips of inspection, had numerous conferences with Federal and municipal authorities and officials of interested corporations and held public hearings in the boroughs of Manhattan, Bronx and Queens. While considerable that was said on these occasions, at the hearings in particular, did not add materially to the fund of information, except to show personal desires for the improvement, the essential facts were brought out.

It appeared from the testimony of boatmen and shippers that two of the pillars of High bridge were a menace to navigation of such

hazard that their removal was a positive necessity. Nearly all were agreed upon this subject, although some objectors were found to advocate the keeping of this ancient bridge. The attitude of the latter people, however, was characterized by their opponents as sheer sentimentality. The structure had served its original purpose and was then so little used that it could easily be dispensed with. It would cost nearly a half million dollars to make such alterations as would do away with the obstructing pillars while still retaining the bridge. To remove the structure entirely, on the other hand, would cost substantially nothing, since the salvage of materials would about equal the cost of demolition.

The Johnson Iron Works, it was learned, represented an investment of about ten million dollars and gave employment to seven or eight hundred men. Its market was in near-by places in the city and a suitable new location was not at hand. The United States engineers' plan for cutting through this plant was costly and contained objectionable features. Other plans were presented to the Board by private individuals, but they either were unsatisfactory or involved more expensive construction than the Federal plans. Also the question of suitable rail connections brought the railway company into the controversy.

As to the advisability of the project, it was shown that the region which would receive large, direct advantage, the boroughs of Bronx and Queens, constituted a considerable portion of the population and wealth of the state and so its claim to share in the benefits of water transportation was entitled to serious consideration. Moreover, this section had developed amazingly in the last few years and natural conditions were favorable for improvement and growth of still more vast proportions. The water-front of this region stretches for many miles and steamship companies were planning accommodations for world-wide shipping. Industrial sites were available and there was bright promise, so the residents of the boroughs thought, that this territory would become one of the largest manufacturing centers of the entire country. New York city as a whole would also be greatly benefited and since it paid about three-quarters of all State expenditures its needs could not be neglected.

In submitting its report to the Legislature the Board of Conference recommended such action as was necessary to secure the completion of the Harlem river project and the prosecution of the Bronx kills project, enterprises which the Board considered as highly needful adjuncts to the State waterway system. It called attention to a statement in the 1919 annual report of the Chief of Engineers of

the United States Army, in which the traffic on the Harlem in 1917 was given as 15,822,342 tons, valued at \$1,788,331,171, and 2,642,908 passengers. In this same report the Chief of Engineers said that he submitted no estimate of funds for prosecuting the Harlem river work because it was believed that the obstruction should be removed before any further work was done. Commenting on this statement the Board of Conference declared that no better argument for the urgent necessity of action was needed, and it added, speaking particularly of High bridge, "It is, therefore, quite evident that the project for the improvement of this inland waterway, inaugurated in 1878 and now after 42 years only 58 per cent completed, will never be finished until this obstruction to navigation is removed."

In detail the recommendations of the Board included the following five main items:

(1) In order to clear the way for straightening the channel at the Johnson Iron Works, the State law which had attempted to make provision for acquiring the right of way should be amended by making certain specified changes, one of them being an appropriation of sufficient amount to carry out the United States engineers' plan of alterations. As this sum would exceed one million dollars, resort must be had to a referendum to the people at a general election.

(2) The city of New York should proceed at once to remove the obstructions to navigation at High bridge, either by taking it down entirely or by reconstructing it so as to eliminate the two obstructing pillars. Moreover, the Legislature should require assurance from the city authorities that such action would be taken before any law for acquiring the right of way at Johnson Iron Works should be enacted. The Board was able to report, however, that there was every reason to expect that the city administration intended to act in coöperation with the State and Federal governments and see to it that High bridge ceased to obstruct navigation.

(3) When the city had given assurance that the High bridge obstruction would be eliminated and the Legislature had made possible the acquisition of the necessary right of way for straightening the channel at Johnson Iron Works, the Secretary of War and the Speaker of the House of Representatives should be notified of such action and requested to take steps promptly for beginning the improvement of the Bronx kills.

(4) The fourth item dealt with a subject concerning which we have merely hinted in our discussion — the railroad problem at the western end of the proposed waterway. The recommendation was that, in any settlement that might be made of the so-called West

Side problem, the city authorities and the Secretary of War should be urged to give due consideration to the necessity of reëstablishing the grade of the New York Central tracks at Spuyten Duyvil so that they would pass over the Harlem on a drawbridge with at least 24 feet clearance at high tide or pass through a tunnel under the river.

(5) As soon as appropriate steps had been taken to straighten the bend at the Johnson Iron Works, to remove the obstructions at High bridge and to widen and deepen the Bronx kills, the State Canal Board should proceed to provide a Barge canal terminal at 136th street, East river, borough of Bronx.

It may be added that at last the completion of the Harlem river improvement seems to be on its way toward attainment. The Legislature of 1922 (by chapter 407) appropriated \$1,500,000 for purchasing the necessary right of way, and the city has taken the first steps to remove the obstructions at High bridge. It will be noticed that the Legislature made provision for the work by direct appropriation rather than by a referendum, such as the Board of Conference thought would be necessary.

CHAPTER XXI

THE CHIEF BUILDERS AND THEIR ASSISTANTS

The State Engineer the Chief Builder—His Duties—List of State Engineers—Mr. Bond's Place in Barge Canal History—Mr Williams' Preeminence among the Chief Builders—Mr Van Alstyne's Important Work in Early Plans and Policies—His Chief Assistants—Mr Skene's Work—His Chief Assistants—Important Undertakings Started during Mr. Williams' First Term—His Chief Assistants—Changes Made and Work Begun by Mr Benschel—Large Amount of Construction during His Term—His Chief Assistants—Completion of Canal and Addition of New Features during Mr Williams' Second Term—His Chief Assistants

IN THE scheme of Barge canal construction the State Engineer has been the official who has carried most of the responsibility for the accomplishment of the enterprise. He has not always held so prominent a place in canal affairs. In the earlier days he shared with the Superintendent of Public Works the duty of supervising works of construction, but this form of divided responsibility was most severely condemned by the investigators of the nine-million-dollar canal enlargement and certain experiences of that ill-fated project led the framers of the Barge canal law to place in the hands of the State Engineer the task of both planning and constructing the new waterway.

Thus the State Engineer became the chief builder of the Barge canal. It was his duty to decide just how the canal should be built, where within specified limits the channel should run, where the structures should be placed and what should be their character, and after these and numberless other decisions were made and had taken on the form of approved plans it was his further duty to see that the contractors built the canal according to these plans or according to such revisions as he should make to meet the contingencies that might arise. The State Engineer, however, was not clothed with autocratic powers; his plans, his revisions, his extra work orders and various other of his activities had to be approved by the Canal Board—a board of which he himself was a member; the consulting engineers constituting the Advisory Board had little real authority at first and never very much, but by their advice and their easy access to the public ear in case they desired to criticise they wielded considerable power; the Superintendent of Public Works awarded

STATE ENGINEERS

1900-1922



EDWARD A. BOND
1900, 1904, 1902, 1903,
1904.



HENRY A. VAN ALSTINE
1904, 1905, 1906.



FRANK M. WILLIAMS
1909, 1910, 1912, 1916,
1917, 1918, 1919, 1920,
1921, 1922.



FREDERICK SKEENE
1907, 1908.



JOHN A. BENSEL
1911, 1912, 1913, 1914.

the contracts and his warrant was the instrument which authorized payments to the contractors; together these two officials accepted completed work; other State officers too had their several parts to do. But naturally the problems of a project essentially engineering in most of its aspects fell to the lot of the only engineer among the responsible officials, and in the end the State Engineer had to shoulder most of the obligation for the proper planning and conduct of the work.

We are interested then in knowing who are the men that have held the office of State Engineer during the construction of the Barge canal—who are these men to whom credit is due for building one of the great engineering works of the world. That this is one of the great engineering works of the world there can be no question. Whatever may be one's opinion of the economic value or the expediency of this or any other canal, or whatever may be one's view as to the best type of canal, if any, for this particular location, there can be no doubt of the high standing of the Barge canal as a work of engineering.

There have been five men to hold the office of State Engineer since the autumn of 1903, the time when the plebiscite was given for building the canal. These are Edward A. Bond, Henry A. Van Alstyne, Frederick Skene, Frank M. Williams and John A. Bensel. But the first one named in the list can scarcely be enumerated among the chief builders. Mr. Bond resigned the office of State Engineer to assume the chairmanship of the Advisory Board so soon after construction was authorized, even before the making of contract plans was more than begun, that we shall not include him in our discussion of the chief builders of the canal.

Mr. Bond, however, occupies a unique place in Barge canal history. He was a member of the committee which after thorough investigation gave to the State its Barge canal policy. He directed the preliminary survey and rendered a report on it which became a model of its kind and a text-book for similar projects. He was responsible for the preliminary estimates, which have been characterized even by a bitter political opponent as being so accurate "that seldom if ever has a work approximating the magnitude of the Barge canal improvement been carried to completion at a final cost for construction so near to that originally estimated" as was the case of the Barge canal. He was chairman of the Advisory Board of Consulting Engineers, a body which for the first seven years of Barge canal construction was accorded by the courtesy of general practice an authoritative supervision over canal planning and building.

Among this list of names there is one which stands out above the others, that of Frank M. Williams. If for no other reason Mr. Williams would be entitled to distinction for his long service. At the close of his present term he will have served as State Engineer for ten years, two years longer than any other incumbent since the Constitution of 1846 created the office. But the length of Mr. Williams' administration, although it extends over more than half the construction years, is not its chief claim to honor. The momentous problems solved under his direction, especially the all-important question of adding terminals to the canal project, and also the periods of his control, both in the early stages and in the years of completion, when the country was struggling with war or its aftermath, have made Mr. Williams preeminent. It is he, therefore, whom history will acclaim the builder of the new waterway; it is he who will be known as the DeWitt Clinton or the Colonel Goethals of the Barge canal.

In reviewing the administrations of the several chief builders of the Barge canal we do not find many sharp distinctions of procedure or radical changes of policy, such as might be found in an enterprise administered by officials selected by other than popular elective methods, such for example as actually did occur in constructing the Panama canal, on which the chief engineers were changed for the very purpose of carrying out new policies and different methods.

It was no easy task to form an organization for so large an undertaking as the Barge canal. It was still more difficult to establish precedents, fix standards, institute studies and do the numberless first things in such a manner that the great work should start in orderly fashion and continue without the prospect of many changes of policy in the future. It is a tribute to the thoroughness and foresight of the first chief builder, Mr. Van Alstyne, that in general his policies were continued throughout the whole work and that but few errors needed correcting.

We may enumerate a few of the achievements of Mr. Van Alstyne's administration, and we shall do little more now than name them, since they are described at length in the chapter on early policies and methods. Several very important matters came before him for consideration or decision. Probably the most important was the change in lock width, an increase from twenty-eight to forty-five feet. It was upon his suggestion that the Legislature authorized this change, and it has proved to be a change far-reaching in its results. To prepare the first specifications was also an important

task and moreover there is one particular feature in them which does Mr. Van Alstyne much credit — the elimination of the classification of excavated materials. Among other policies of Mr. Van Alstyne's choosing may be mentioned the substitution of movable for fixed dams in the Mohawk river, the use of concrete in nearly all structures in preference to cut-stone masonry and the selection of test contracts to determine at the beginning the probable cost of the whole enterprise. Under Mr. Van Alstyne the most important of the changes in route and plan were made. These included a new location at the eastern end of the Erie canal, the selection of route which resulted in the remarkable series of high lift locks in the short stretch of land line between the Hudson and Mohawk rivers in the vicinity of Waterford; also a new route which began with a contemplated short change of alignment at Savannah and expanded into a long and radical variation, including eventually a new branch in the canal system. The new grade for the Tonawanda-Lockport level was determined at this time. In addition Mr. Van Alstyne made the first survey for the new Cayuga and Seneca canal and instituted the study which brought Federal cooperation for the channel from Troy to Waterford.

Mr. Van Alstyne had as his Special Deputy Henry C. Allen. The Special Deputy State Engineer was the man who was in immediate charge of the whole Barge canal work, the office having been created by the law authorizing canal construction. The three Division Engineers were Charles W. Trumbull on the Eastern Division, Charles O. McComb on the Middle Division, and A. J. Rockwood on the Western Division.

Mr. Skene's administration was the shortest of any during Barge canal building, only two years, 1907 and 1908. The period was early in the enterprise, before construction had really got under full headway and also before certain, new, all-important features arose, and yet after the main questions of policy and methods had been decided. There were a few circumstances of importance, however, in Mr. Skene's time. He was the first State Engineer to bring the need of terminals prominently before the people and to recommend that these most necessary adjuncts be included in the canal scheme. He joined forces with the Deeper Hudson advocates and also pushed with vigor the plan of his predecessor to secure Federal assistance for the Troy-Waterford section. It was Mr. Skene who began publishing the *Barge Canal Bulletin*, and the studies made under his guidance included those for the Syracuse harbor, the movable dams at

Rochester and Phoenix and the troublesome and complex route through Rome.

Mr. Skene's Special Deputy was William R. Hill, a man who had made a name for himself as the chief engineer of the Syracuse water works. As Division Engineers there were J. F. Creeden for a short time and then L. B. Harrison on the Eastern Division, Henry B. Brewster on the Middle Division and John P. Kelley on the Western Division.

It should be remembered that both Mr. Van Alstyne and Mr. Skene had charge of State highway construction as well as the building of the Barge canal, and the highway work had grown to large proportions by that time. A poll of the engineers under Mr. Skene on both canal and highway projects would have shown a corps of about eighteen hundred men. Soon after Mr. Skene's administration the highways were transferred from the State Engineer's department to a special commission, but it was during Mr. Skene's term that action was taken to effect this change.

During Mr. Williams' first term, 1909 and 1910, several important things happened, the most important being the appointment of a Terminal Commission, a body of which Mr. Williams was chairman. This Commission made an exhaustive study of the whole terminal question and rendered a report which, it may be said incidentally, stands at the top of terminal literature, but it also did that which was of greatest import to the State, it gave a new canal policy, no less a policy indeed than one for adding to the original canal scheme the feature upon which the success of the whole project mainly depends.

Second in importance of the events of this administration was the adding of the Cayuga and Seneca canal to the Barge system. The first survey for this branch had been made under Mr. Van Alstyne, but early in 1909, after lying quiescent since 1905, the project came to a head and before the year closed the preliminary surveys and estimates had been made and the scheme had received, first legislative approval and then popular authorization at the polls, and prior to his retirement at the close of 1910 Mr. Williams was able to prepare contract plans and put the first contracts in force.

Another piece of work which Mr. Williams instituted was what is known in canal parlance as the "blue line" surveys. The time was at hand when much would have been lost to the State by way of property values and to its citizens by way of information relating to considerable private property, had this work not been undertaken.

It was fortunate that there was serving the State at this particular juncture a man with Mr. Williams' long familiarity with State engineering affairs as well as his breadth of vision to appreciate the necessity of the case.

During this administration there came also Federal aid for the Troy-Waterford section, important decisions affecting railroad crossings, a series of tests for the proposed Medina aqueduct and the first recommendation relative to charting new canal waters.

Mr. Williams selected his chief assistants from among those who like himself had been long in the State Engineer's department and were thoroughly familiar with the problems which would confront them. William B. Landreth served as Special Deputy, while the Division Engineers were George D. Williams for the Eastern Division, Guy Moulton for the Middle Division and Thomas W. Barrally for the Western Division. It will be recalled that Mr. Landreth had been prominent in the preliminary Barge canal survey and had had charge of such work as had been done between the time of popular ratification of the project and the appointment of the first Special Deputy State Engineer.

Mr. Bensel came to the office of State Engineer with the prestige of having been at the head of other large engineering works and of being at that time the President of the American Society of Civil Engineers. For the first time in many years the Democratic party was coming into full control of the State government and changes were rife. Mr. Bensel himself was not in accord with various acts of his predecessors, and being a man of pronounced opinions and direct address, he did not hesitate to criticise and to change where he saw fit.

Prominent among the changes was the abolition of the Advisory Board of Consulting Engineers, accomplished of course by legislative act but done at the State Engineer's suggestion. In place of this board the State Engineer was permitted to employ, with the approval of the Governor, one or more consulting engineers.

One of the first things to take Mr. Bensel's attention was the problem of railroad crossings. This feature of the work he regarded as having been particularly slow in progress and wrong in management. What he did in carrying out his ideas, however, resulted in throwing the affair into the courts. It remained there till the last year of his administration and then a decision was rendered which upheld the action of the former administrations. Another change attempted by the State Engineer met with no better success. The

authority of Federal control over the waters of the Hudson at Troy was questioned and attempt was made to stop Government construction at the Troy lock and dam, but without avail.

At certain places Mr. Bensel found it advisable to make changes in structural designs. The most notable of these were the substitution of pneumatic-caisson for coffer-dam methods in building the lock and dam at Scotia and the use generally of heavier steel construction, including the strengthening of bridge superstructures at the Mohawk river movable dams.

Construction of canal terminals was begun under Mr. Bensel and considerable progress was made during his term of office. This was the outstanding new venture of his time. The policy he instituted of waiting for traffic to demonstrate its need of certain facilities before attempting to supply those facilities has remained the accepted policy throughout terminal construction.

This was the time of the Commission on Operation and Mr. Bensel served on that body. It was also the time of the serious break at Irondequoit creek, for the repair of which speed and resourcefulness were demanded. In this administration Congress was induced to extend the Lakes Surveys to cover the navigable natural streams of the Barge canal system, thus assuring Federal charts for these waters. The need of making legislative provision for the disposal of old canal lands abandoned by reason of new alignments was a subject of Mr. Bensel's propounding.

The years of Mr. Bensel's administration, 1911 to 1914, both inclusive, were the years of largest accomplishment in the amount of canal work done. Measured in money values about half of the work was done during these four years. But this fact does not entitle Mr. Bensel to unusual credit nor detract from the honor due to the other chief builders. It was to be expected that the middle period of construction would be the most active.

In choosing his principal assistants Mr. Bensel did not bring many new men into the department. Some of his earlier appointments were from among the existing corps and all of his later selections were from that source. Alex. E. Kastl was Special Deputy, John A. O'Connor and Edwin Styring were promoted to be Division Engineers of the Eastern and Middle Divisions, respectively. Edward J. Govern was the Western Division Engineer. When terminal construction began Mr. O'Connor was placed in charge, having the title of Terminal Engineer. To fill the vacancy thus made, Dwight B. LaDu was promoted to Eastern Division Engineer.

Two Division Engineers for terminals were appointed, Carleton Greene for the Southern Division and Guy L. Noble for the Middle Division, both of them being elevated from lower ranks. On August 1, 1914, Mr. Kastl resigned as Special Deputy and Mr. LaDu was appointed to the position. Thus again the office of Eastern Division Engineer was vacant and R. G. Finch was promoted to fill it. On April 1, 1914, Mr. Govern resigned as Division Engineer of the Western Division and Friend P. Williams was appointed to the vacancy, this also being a promotion. As Consulting Engineers there were appointed George S. Greene, Jr., William H. Burr, T. Kennard Thomson, Mortimer G. Barnes and Joseph Ripley. Mr. Barnes and Mr. Ripley had been members of the Advisory Board of Consulting Engineers. Mr. Ripley was the only Consulting Engineer employed full time for canal work.

Mr. Williams began his second administration under most unpropitious circumstances. The canal was not completed, the appropriation was over-obligated by the contracts then in force and funds were actually so nearly exhausted that all work must stop within a few months unless additional money should be forthcoming.

Mr. Williams' task was to finish the canal and to do this as quickly as possible in spite of many handicaps and the numberless loose ends and last things that might be expected, necessarily perhaps, in an enterprise of such magnitude.

Early in the administration the separate terminal organization was abolished and the whole work, on both canal and terminals, was supervised by one and the same set of officials.

One of the chief things to engage Mr. Williams' attention after the way was cleared to getting additional funds was the Rochester problem. Here, as we have seen, there had been endless discussion without getting satisfactory results, but by the time the new appropriation was available construction could be started in accordance with plans acceptable to both the State and the citizens of Rochester.

Among the questions to be solved early in this administration were those relating to the larger types of navigation aids, such as lighthouses, lake buoys and the like. Then too there was the troublesome and seemingly endless problem of railroad crossings. Soon there came the necessity of completing the canal while contending against the almost insuperable difficulties of war-time restrictions and delays, and with this need came also the incentive to overcome in spite of all odds. The story of this achievement we have already heard and this alone would make Mr. Williams' administration memorable.

With the war new duties devolved upon the chief canal builder. There was a State Council of Defense, of which the State Engineer was a prominent member. In modern warfare the engineer has a large place and so the engineer in the Council of Defense was an important personage. Mr. Williams played a large part also in inducing the Federal government to take over and operate the canal he had finished under such trying circumstances.

Among new canal features to appear in Mr. Williams' administration are the Hudson river terminals, two special bridges over the canalized Mohawk, at Rexford and Scotia, the latter being an unusual structure, and the grain elevators at New York city and Oswego. Elevators stand next in importance to terminals in the list of canal adjuncts, and with the adding of both of these two essentials to the Barge canal project Mr. Williams' name is inseparably and most prominently linked.

Now that there has arisen strong agitation for a rival waterway, a ship canal to the Great Lakes, an impracticable dream as viewed by New Yorkers, Mr. Williams has been in the forefront of opponents to this scheme, which, to say the least, has turned away from the Barge canal the thoughts of those living west of the state, so that they are not inclined to give the New York waterway a fair trial.

At the beginning of Mr. Williams' present administration his Special Deputy was Dwight B. LaDu, who was retained from the preceding administration. The Division Engineers were George D. Williams and Guy Moulton for the Eastern and Middle Divisions, respectively, both of them having served in the same positions during Mr. Williams' first administration. The Western Division Engineer was Friend P. Williams, also retained from the preceding administration. In the fall of 1918 Mr. LaDu resigned. He was succeeded on January 1, 1919, by Friend P. Williams, the work of the Special Deputy having been assumed during the interim by William B. Landreth, Deputy State Engineer. During the war Division Engineer George D. Williams entered the service and while he was absent his work was performed, first by L. C. Hulburt and later by Russell S. Greenman, Mr. Hulburt acting till January 1, 1919, when he was appointed to fill the vacant position of Western Division Engineer. On September 1, 1919, E. D. Hendricks was made Eastern Division Engineer, George D. Williams having resigned. In the early summer of 1921 Friend P. Williams resigned as Special Deputy and thereafter such canal and terminal supervision as remained was assumed by R. G. Finch, Deputy State Engineer.

As Consulting Engineers Mr. Williams has had Henry C. Allen, Elmer L. Corthell, E. E. Haskell, E. C. Moore, Joseph Ripley, Henry Goldmark and William B. Landreth. During the early years of the administration Mr. Ripley gave all his time to the work and in the later years Mr. Landreth has done the same; the others were employed only occasionally. For consultation on terminal work, B. F. Cresson, E. P. Goodrich, H. McL. Harding and Maurice W. Williams have been employed on various occasions. In addition three others have acted in a consulting capacity for special work — B. A. Davis in concrete arch construction, H. R. Wait in grain elevator design and C. C. Egbert in electrical work. Mr. Egbert has acted as expert electrical advisor during most of the canal construction period.

CHAPTER XXII

OFFICIAL MACHINERY

Canal Board. Its Powers and Duties List of Members during Barge Canal Construction—Advisory Board of Consulting Engineers Its Peculiar Office: Its Duties. Its Members—Comptroller His Duty in Issuing Bonds: His Duty in Auditing Accounts and Issuing Warrants for Payments—Attorney-General His Duties as Legal Advisor to Canal Board and Defender of Claims against State—Superintendent of Public Works His Duties in Awarding Contracts, Approving Alterations, Making Payments, and Appraising and Securing New Lands. His Membership on Important Canal Bodies. His Duty in Maintaining Navigation—State Engineer and Surveyor. His Duties. His Organization. His Membership on Important Canal Bodies—Special Examiner and Appraiser of Canal Lands: Creation of the Office. Duties and Usefulness of the Appraisers: List of Men Holding the Office

WHILE the construction of the Barge canal in the main was a work of engineering and most of it fell under the care of the State Engineer and his staff of assistants, there were several other State officials who in one way or another had vital association with the enterprise and performed certain important duties connected with its accomplishment. It is our purpose in the present chapter to mention these officials and describe briefly the parts they played, and also in connection with these descriptions to give the names of the several individuals who held the offices during the period of canal construction. Frequently in the present volume the officials are mentioned by name of office only, especially in the case of bodies composed of several persons, and so these lists are added, that they may be at hand for easy reference, if one desires to know who were the persons involved in various acts.

CANAL BOARD

The chief governing body in supervising all canal affairs in the state is the Canal Board. This Board was established in 1826, only one year after the completion of the original Erie canal, and ever since then it has exercised this power of general control. The Barge canal act did not abridge its powers, if anything it increased them, and it specifically defined the duties with reference to the new work in such fashion as to give it final control, no individual officer being

allowed, without the Board's approval, to go beyond certain well-defined and safe limits. In a former chapter we likened the Canal Board to a board of directors of a great corporation in which the people of the state are the stockholders. The figure seems peculiarly appropriate to apply to this body.

In the course of construction, after plans and estimates had been made, they had to be approved by the Canal Board before contracts could be let and subsequently no alterations that would increase the cost of the work could be made without its consent. No contract could be awarded on a proposal that exceeded the estimate by more than a fixed amount and also no single item of work during construction might overrun the estimate by more than a small percentage without the Board's approval and in the latter instance the Board might determine to have the excessive work done by the Superintendent of Public Works or under a special contract rather than by the original contractor. The Board had power to suspend any contract upon which construction was not progressing in a satisfactory manner and to direct the Superintendent of Public Works to proceed with the work or to order it relet to another contractor. The approval of the final account, after contract work was completed and accepted, also devolved upon the Canal Board.

The Canal Board is composed of seven State officers, six elective and one appointive. They are: Lieutenant-Governor, Secretary of State, Comptroller, Treasurer, Attorney-General, Superintendent of Public Works and State Engineer and Surveyor.

The first five officers named constitute the Commissioners of the Canal Fund — a body whose existence antedates the Canal Board by nine years, having been created by the act which authorized the building of the original Erie and Champlain canals. As the name signifies these commissioners are intrusted with supervision of the canal fund.

The men who have been members of the Canal Board since 1903 and the years of their incumbency are as follows: Lieutenant-Governors: Frank W. Higgins, 1903 and 1904; Matthew Linn Bruce, 1905 and 1906; Lewis Stuyvesant Chanler, 1907 and 1908; Horace White, 1909 and until October 6, 1910; Thomas F. Conway, 1911 and 1912, Martin H. Glynn, January 1 to October 17, 1913; Edward Schoeneck, 1915, 1916, 1917 and 1918; Harry C. Walker, 1919 and 1920; Jeremiah Wood, 1921 and 1922, till September 26.

Secretaries of State: John F. O'Brien, 1903, 1904, 1905 and 1906; John S. Whalen, 1907 and 1908; Samuel S. Koenig, 1909 and 1910;

Edward Lazansky, 1911 and 1912; Mitchell May, 1913 and 1914; Francis M. Hugo, 1915, 1916, 1917, 1918, 1919 and 1920; John J. Lyons, 1921 and 1922.

Comptrollers: Otto Kelsey, November 12, 1903, to November 8, 1906; William C. Wilson, November 8, 1906, to December 31, 1906; Martin H. Glynn, 1907 and 1908, Charles H. Gaus, 1909 till his death in November; Clark Williams, November 12, 1909, to December 31, 1910; William Sohmer, 1911, 1912, 1913 and 1914; Eugene M. Travis, 1915, 1916, 1917, 1918, 1919 and 1920, James A. Wendell, 1921 and 1922 till his death on May 10; William J. Maier, 1922, beginning in May.

Treasurers: John G. Wickser, 1903 and 1904; John G. Wallenmeier, Jr., 1905 and 1906, Julius Hauser, 1907 and 1908; Thomas B. Dunn, 1909 and 1910; John J. Kennedy, 1911, 1912, 1913 and 1914 till his death in February; Homer D. Call, February 25 to December 31, 1914; James L. Wells, 1915, 1916, 1917, 1918, 1919 and 1920; N. Monroe Marshall, 1921 and 1922.

Attorneys-General: John Cunneen, 1903 and 1904; Julius M. Mayer, 1905 and 1906; William S. Jackson, 1907 and 1908; Edward Richard O'Malley, 1909 and 1910; Thomas Carmody, 1911, 1912, 1913 and 1914 till September; James A. Parsons, September 2 to December 31, 1914; Egbert E. Woodbury, 1915, 1916 and 1917 until April; Merton E. Lewis, April 25, 1917, to December 31, 1918; Charles D. Newton, 1919, 1920, 1921 and 1922.

State Engineers and Surveyors: Edward A. Bond, 1903 and 1904 till May 1; Henry A. Van Alstyne, May 10, 1904, to December 31, 1906; Frederick Skene, 1907 and 1908; Frank M. Williams, 1909 and 1910; John A. Bensel, 1911, 1912, 1913 and 1914; Frank M. Williams, 1915, 1916, 1917, 1918, 1919, 1920, 1921 and 1922.

Superintendents of Public Works: Charles S. Boyd, December 20, 1901, to January 4, 1905; Nicholas V. V. Franchot, January 4, 1905, to January 14, 1907; Frederick C. Stevens, January 14, 1907, to January 4, 1911; Charles E. Treman, January 4, 1911, to January 1, 1913; Duncan W. Peck, January 1, 1913, to January 6, 1915; William W. Wotherspoon, January 6, 1915, to February 3, 1919; Lewis E. Nixon, February 3 to May 3, 1919; Edward S. Walsh, May 3, 1919, to January 19, 1921; Charles L. Cadle, January 19, 1921, to —.

ADVISORY BOARD OF CONSULTING ENGINEERS

The board of advisory engineers was created by the Barge canal act. The members were appointed by the Governor and in this particular the board did not differ greatly from other bodies

similarly appointed. But really there was a somewhat intimate relationship between the Governor and this board, perhaps not so much expressed in the law as implied, the outgrowth of a widespread feeling that because of the immensity and importance of the undertaking the Governor should keep his hand upon it through these carefully-selected expert engineers, who should be answerable only to himself. The board made its annual reports directly to the Governor. There was a feeling abroad too that there should be some continuing body, removed from the reach of party politics, that would preserve a unity of plan and operation in canal construction during changes which might occur in the coming of new administrations. When the Barge canal project had been presented to the people, great stress was laid upon this board, for both its permanency and the high order of ability and character of the men who should be appointed.

Under the creating statute the duties of the board were strictly advisory and it had no authority by law to compel acceptance of its suggestions. As a matter of fact, however, its opinions were almost always treated with as much respect as if they had legal weight. Nearly every question of moment concerning the new canal was submitted to the Advisory Board and also persons who had suggestions to make or grievances to register appeared before this Board just as they appeared before the Canal Board for like purposes. Even before the law directed such action it was customary to submit plans, specifications and estimates to the Advisory Board before they went to the Canal Board and whatever changes the advisory engineers suggested were made before the plans were ever sent to the Canal Board for approval.

Two amendments to the Barge canal law had to do with defining the duties of the Advisory Board in certain particulars. The first, passed in 1907, made it mandatory on the State Engineer to submit both contract plans and alterations to the Advisory Board before sending them to the Canal Board. The second, passed in 1908, required the State Engineer to send copies of appropriation maps to the Advisory Board before they were submitted to the Canal Board. In each instance the Advisory Board was directed to make examinations and reports on the subjects submitted. It was necessary, therefore, for the advisory engineers to keep in close touch with all the work of construction, both prospective and actual. This was the more necessary because of the stand the Superintendent of Public Works took of not paying the monthly estimates until a majority of the advisory engineers had made a certificate attesting the satisfactory character of the work performed.

A statute of 1904 provided that the terms of office of the advisory engineers should continue during the construction period of the improvement, but an act of 1911 terminated the Board and this took effect on July 21, 1911.

At the beginning of its existence, early in 1904, the Advisory Board consisted of Edward A. Bond, chairman, William A. Brackenridge, Elmer L. Corthell, Alfred Brooks Fry and Thomas W. Symons, and during its life there were but two changes in membership. On July 31, 1907, Mortimer G. Barnes took the place of Dr. Corthell, resigned, and on November 5, 1909, Joseph Ripley replaced Mr. Brackenridge, also resigned.

There are four State officials who, aside from their duties as members of the Canal Board, have had much to do with canal construction by reason of responsibilities imposed upon them as individual officers. These are the Comptroller, the Attorney-General, the Superintendent of Public Works and the State Engineer and Surveyor.

COMPTROLLER

The Comptroller's main duties in connection with the canal have been two in number—to take charge of issuing State bonds for raising funds and to audit accounts and issue warrants for payments. The Comptroller's connection with the bond issue extended from the time the blank paper was received to the time the funds were paid in. The paper for the bonds, especially water-marked, was delivered to the Comptroller under a certified double count. He delivered a sufficient number of sheets to the engraver for each issue, getting a receipt for them. After the engraving, the paper was fully accounted for, either in actual bonds or in imperfect or blank sheets. Then after the bonds had been carefully examined and the signature and seal of the Comptroller had been affixed, they were sent to the State's transfer office, a certain banking house in New York city, for counter signature. Next the Comptroller advertised the sale of the bonds and awarded them to the successful bidder or bidders. Then the transfer officer, upon the receipt of payment, placed the money to the credit of the Treasurer of the State in the account of the canal fund.

Upon the Comptroller devolved the duty of auditing the accounts of all moneys expended for Barge canal purposes. These included the payments to contractors, payments for engineering expenses, payments for permanent appropriations of land and for damages thereto, the expenditures of the Advisory Board of Consulting

Engineers and of the Special Examiner and Appraiser for the purchase of lands, and various miscellaneous expenses incidental to the work of constructing the canal. Advances were made for engineering expenses to the division engineers of the State Engineer's department and abstracts of expenditures with accompanying vouchers were presented monthly and duly audited by the Comptroller. Accounts and vouchers were presented by the Superintendent of Public Works for miscellaneous expenditures, together with his draft, and these drafts were paid from the treasury upon the warrant of the Comptroller. Monthly estimates were prepared by the resident engineers and approved by the division engineer, the State Engineer and the Advisory Board of Consulting Engineers (while that body was in existence) for the work of construction on each of the contracts, and drafts were issued by the Superintendent of Public Works on the Comptroller and payment of each draft was made by the Treasurer's check, issued on the warrant of the Comptroller after due audit of each estimate by him. The payments for lands acquired either through judgments of the Court of Claims or by agreements entered into by the Special Examiner and Appraiser, as well as all other miscellaneous payments incidental to construction, were made, upon the rendition of accounts and vouchers in due form, by the Treasurer's check, issued upon the warrant of the Comptroller. The organization in the Comptroller's office to care for this work is the Bureau of Canal Affairs.

The names of the men who have held the office of Comptroller since Barge canal work began are given in connection with the list of members of the Canal Board.

ATTORNEY-GENERAL

The Barge canal law placed on the Attorney-General the duty of approving the form of contract under which work should be let and also the form under which security should be given by a contractor for the faithful performance of such work. If this had been his only duty his connection with the waterway would have been of little consequence, but as legal advisor of members of the Canal Board there fell upon him an important part in the work of canal improvement. In the letting of contracts and the construing of their terms, in appropriating lands and waters and in legal questions that have arisen during the whole progress of construction the advice of the Attorney-General has often been sought. But by far the major part of his service has consisted in defending claims brought against the State in the Court of Claims for damages alleged to have been sustained by reason of the Barge canal or its construction.

For several years the Court of Claims was engaged almost exclusively in disposing of Barge canal claims. Many millions of dollars have been involved and the responsibility resting on the Attorney-General has been great. Two especially important questions entered into several of the claims—the rules for the valuing of water-power and a decision as to what constitutes riparian rights—questions which, although considered in original canal construction, might still be treated as open to settlement by the highest courts

The men who have held the office of Attorney-General since the Barge canal law was passed are also listed among the names of Canal Board members

SUPERINTENDENT OF PUBLIC WORKS

The official who aside from the State Engineer has had closest connection with Barge canal construction is the Superintendent of Public Works. While the Superintendent had nothing to do with making contract plans, his relation to the plans after they were prepared was very intimate. As a member of the Canal Board he had a voice in their approval. Since, however, only two members of the Canal Board, the State Engineer and the Superintendent, might be expected to have any technical knowledge of the work, the judgment of these two was generally accepted and followed by the others and from this practice the custom became established of submitting the plans and specifications to the Superintendent for his examination before they were sent to the Canal Board. This arrangement between the two officials was found to work well, for it gave opportunity of adjusting any points of difference before the plans came to the Board for approval.

After plans had been approved by the Canal Board it was the duty of the Superintendent to award the contracts. He advertised the letting in accordance with directions laid down in the Barge canal law, fixed the date on which sealed proposals would be received, opened the bids on the given day and then awarded the contract. In all of this procedure there were many details that entered into the task, such as printing books of instructions to proposers, which contained also bidding sheets and specifications, exhibiting the plans, receiving and caring for the certified checks or drafts accompanying the bids, canvassing the bids, deciding whether they were formal and proper in every respect and determining whether the proposer had apparent resources and ability to perform the contract. After the award the contract could not be assigned or transferred without the approval of the Superintendent.

During the course of construction no alteration might be made in any plan or specification until it had first been approved by the Superintendent of Public Works, the State Engineer's approval having previously been given. Also, should the proposed alteration entail an increase of cost or create a claim against the State, it had to be submitted to the Canal Board for approval.

Payments, both monthly and final, for contract work were made by drafts issued by the Superintendent. Under the law he needed no other authority to warrant him in making payments to the contractors than the certificate of the State Engineer as to the amount and character of the work performed, but deeming it expedient that he should have an engineer in his own department to pass upon estimates and construction work, he appealed to the Legislature and was granted permission to employ an advisory engineer. The Superintendent also took the added precaution of requiring with each estimate of work done a certificate signed by a majority of the individual members of the Advisory Board of Consulting Engineers attesting that the work had been done in accordance with the plans and specifications. In the acceptance of a finished contract the State Engineer and the Superintendent of Public Works were jointly responsible.

The duty of serving papers on the owners of land to be taken for canal construction devolved upon the Superintendent. In addition to the examination and appraisal of such property by the Special Examiner and Appraiser, the Superintendent caused an independent examination to be made and the valuations fixed by the two agents had to agree closely before settlement could be made. After the Special Examiner and Appraiser had agreed with an owner as to the amount to be paid by the State, such agreement had to receive the Superintendent's approval and then the Superintendent presented the matter to the Canal Board for approval. In 1915 a Bureau of Appraisal was established in the Superintendent's department, taking the place of former machinery for acquiring property, and since then the whole of such procedure has been in charge of the Superintendent. Copies of all claims brought against the State in the Court of Claims on account of Barge canal work must be filed in the department of Public Works.

The Superintendent has been a member of nearly all the various boards and commissions that have had to do with canal investigations. At the very beginning he was one of the five men to constitute the Committee on Canals, the body that formulated the Barge canal

policy. On the Terminal Commission he was one of four members. On the Commission on Operation he was supreme, the body being made up of the active Superintendent, two who had formerly held the office of Superintendent, one who had been Deputy Superintendent for a dozen years, and the State Engineer. On the Jamaica Bay-Peconic Bay Canal Board, the Board of Conference on the Gravesend Bay-Jamaica Bay Waterway, and the Board of Conference on the Harlem River Improvement the Superintendent was one of three members in each case. For making the Tonawanda-Buffalo investigation the Superintendent was one of the two appointed. For carrying out the new canal water-power policy the Superintendent has most of the responsibility. He is also a member of the commission appointed to uphold the interests of the State in the St. Lawrence ship canal contest.

The Superintendent of Public Works and his predecessors before him, the Canal Commissioners, have had charge of maintaining navigation on the State canals ever since there have been any canals in New York to navigate. Since nearly all of the canal system has been kept open during the entire period of Barge canal building, the Superintendent, in order to be sure that nothing would interfere with navigation, has had to keep in intimate touch with the actual work of construction, although the State Engineer had charge of it. This has necessitated a close coöperation between the two officials and fortunately for the undertaking such a state has existed. Of course there have been many differences of opinion, it was the State Engineer's duty to build the canal and the Superintendent's duty to maintain navigation and often the two interests conflicted, but a way has always been found out of every such dilemma. Under certain conditions also the Superintendent has acted as contractor, and workmen employed by him have constructed portions of the canal. This has happened on a few small pieces of work, when the Canal Board has exercised its prerogative under the law and has decided to do the work in this manner, but it has happened also on some large pieces of work, the Canal Board again exercising its prerogative and ordering the Superintendent to complete a contract terminated by the Board or on which the contractor had defaulted. After portions of the channel or the canal structures have been completed they have been turned over to the Superintendent and thereafter they are in his charge.

The names of the several Superintendents of recent years appear in the list already given in connection with the Canal Board.

STATE ENGINEER AND SURVEYOR

The chief responsibility for constructing the Barge canal has rested upon the State Engineer. His was the task of selecting the route and showing the feasibility of the canal before the question of its building was brought to final issue. After the project was authorized it was his duty to determine and plan all details of construction and then to supervise the actual work of building. He took the measurements and computed the estimates month by month for paying the contractors and at the end he made the final measurements and estimates for completing the payments. Together with the Superintendent of Public Works he accepted the finished contracts in behalf of the State. This description briefly outlines the State Engineer's connection with the Barge canal, but there has been an almost infinite amount of detail included in this work and it is useless to attempt even an enumeration of its many phases. Perhaps the story can be told most concisely by saying that the State Engineer has done nearly everything needful which has not been recorded in this chapter as the specific duty of some other official.

The State Engineer required a large corps of assistants to carry on this work. The authorizing law made special provision for the directing heads, allowing the appointment of a Special Deputy and additional Resident Engineers. The organization has not remained the same throughout construction, but in general the Special Deputy's office contained the following divisions: Bureau of Designing and General Drafting, Bureau of Locks, Bureau of Rivers, Bureau of Water-supply, Bureau of Bridges, Bureau of Electrical Equipment, Bureau of Hydraulics, Bureau of Computing and Checking, Bureau of Publication and Reports and Testing Laboratory. These bureaus were in charge of Supervising Engineers, special expert engineers and Resident Engineers. During the first four years of terminal construction there was a separate organization for that work. Then it was made a bureau in the Special Deputy's office. In the later years it has been necessary to have a bureau for collecting and preparing material for use in defending claims against the State. Since the cases before the Court of Claims usually hinge on engineering data or questions of fact as recorded in the files of the department, it has come about that the Attorney-General depends largely on the State Engineer to furnish the material for the defense.

For supervising construction numerous residencies were established, with offices at various cities or villages along the canal. All told there have been between 25 and 30 of these residencies, each in charge of a Resident Engineer, or as he is called now, a Senior

Assistant Engineer. Each residency usually covered the work being done under many contracts, and as a rule there was a field office with a corps of assistants for each contract and sometimes several such offices for a single large contract.

In all that has pertained to adding new features or new branches to the canal system the State Engineer has had a part, generally the chief part. He was a member of the Canal Committee that recommended the building of the Barge canal, but he was not the head of this body. The same was true with respect to the Commission on Operation. He was chairman of probably the most important body of all, the Terminal Commission, and also of the Jamaica Bay-Peconic Bay Canal Board, the Board of Conference on the Gravesend Bay-Jamaica Bay Waterway, and the Board of Conference on the Harlem River Improvement. He and the Superintendent of Public Works jointly made the Tonawanda-Buffalo investigation, but the State Engineer presented the report to the Legislature. Of the commission for defending the State's interests in the St. Lawrence ship canal controversy the State Engineer is an important member.

There have been only five men to be State Engineer since agitation for the Barge canal began. A list of their names appears in the chapter dealing with the Chief Builders, also in connection with what was said about the Canal Board in the present chapter and again in the chapter containing lists of Barge canal engineers of the higher grades.

SPECIAL EXAMINER AND APPRAISER OF CANAL LANDS

The Barge canal law made provision for acquiring lands or waters needed for the new canal, but it did not specify any means for making compensation for property taken except through the medium of the Court of Claims. A shorter, simpler and less expensive way was essential, not only for rapid progress but also for the convenience and satisfaction of both State officials and property owners. At the first opportunity after the passage of the original law, therefore, provision was made for the appointment of special agents whose duty it should be to negotiate with owners for settlements without resorting to court proceedings. The Legislature of 1904 (by chapter 335) authorized the Governor to appoint three Special Examiners and Appraisers.

After papers for appropriating lands or structures had been served and maps duly filed, it became the duty of these appraisers to visit the localities, to inspect and make proper examination of the land and also of any buildings which might be on the properties, to

make careful note of their findings in books kept by them for the purpose, to make inquiries concerning the values of properties to be taken, and immediately to begin negotiations for their purchase.

It happened sometimes that agreements could be reached while the appraisers were still on the ground, but in other cases this could be done only after prolonged negotiations and frequent visits to the properties. As soon as an agreement was reached the appraisers executed a contract with the owner and this was submitted to the Canal Board for approval at its next meeting. If the Board did not approve, the contract was returned to the appraisers; if it did approve, the secretary of the Canal Board notified the owner and requested him to forward a deed to the Attorney-General. After search had been made and a satisfactory title proved, the Attorney-General made a certified statement of this fact to the Comptroller, who issued a warrant upon which a Treasurer's check was sent to the owner and the transaction was closed.

It was a fortunate happening that brought about this arrangement for making property settlements. In the course of canal construction it became necessary often to dispossess people of their homes and properties against their wills and the cold and unfeeling processes of the law were repugnant to them. It was the general sentiment that the appraisers were dealing fairly by both the State and the property owners and as a result the people were usually satisfied with the settlements. Some of the owners took their cases to the Court of Claims and of the judgments awarded very few exceeded the figures previously determined by the appraisers. Moreover the settlements effected by the appraisers were much speedier. The Court of Claims was so burdened with cases that long delays were inevitable.

Those who served as Special Examiners and Appraisers were Harvey J. Donaldson, J. Edgar Leaycraft and George Bingham. They held their positions for four years. Then the law which created the offices was repealed and in their stead the Governor was empowered to appoint a single Special Examiner and Appraiser of canal lands. There were three men to hold this office. Harvey J. Donaldson was appointed on May 1, 1908, William B. Milliman on June 28, 1911, and Edwin S. Harris on December 23, 1914. The Legislature of 1915 abolished the office and in its place created in the department of the Superintendent of Public Works a bureau of appraisal to consist of a Special Examiner and Appraiser and such subordinates as the Superintendent deemed necessary, all to be appointed by the Superintendent.

CHAPTER XXIII

SOME ENGINEERING FEATURES

High Rank of Barge Canal as an Engineering Work—General Features of Locks—Siphon Lock—High Lift Lock at Little Falls—Tandem Locks at Lockport—Large Fixed Dams in Mohawk at Crescent and Vischer Ferry—Movable Dams. Bridge Type Tainter Gate Type Submersible Sector Gate Type—Siphon Spillway—Automatic Crest on Dam—Concrete Troughs for Carrying Canal—Noteworthy Section near Waterford—Canal and Railroad Construction at Rome—Complicated Situation at Rochester—Interesting Problem at Medina

“H^AVING had the opportunity, through the courtesy of the State Engineer, of seeing practically all the main canal and its principal branches,” said a visiting Federal engineer, “I can say without reservation that in no other area of the same extent in the world, including the Panama canal, can an engineer find so much of interest and instructive value in the matter of various types of canalization work. It surprises one after such an inspection that there is not a more general knowledge throughout the country of the canal, its construction and commercial probabilities.” *

Speaking editorially of the *Book of Plans, New York State Barge Canal*, a publication issued by State Engineer Williams particularly for the use of the engineering profession, the *Engineering News-Record* said in its issue of April 28, 1921, “Whatever be the opinion regarding the New York State Barge Canal as an economic factor there can be no doubt of its high standing as a work of engineering. With few exceptions its structures have been models of detail design which may well be set up as standards for future shipping canal work. . . . Too infrequently are the structural records of big projects preserved in such convenient form”

The high rank of the Barge canal as an engineering work is attested also by many other competent judges. It does not seem necessary in the present volume, however, for the historian to exercise his character as engineer and discourse either at length or in technical phrase on the many engineering achievements of the enterprise. Much has already been written concerning these features,

* Excerpt from letter of Major C. O. Sherrill.

in both professional and popular style, and accordingly there is no need for long repetitions. Moreover for the engineer there is the *Book of Plans*, which often gives in a single drawing what a multiplicity of words cannot so well describe. But this volume would not be complete without at least a brief mention of various engineering features and therefore a few of the salient facts are noticed.

There are 35 locks on the Erie branch of the Barge canal, 11 on the Champlain, 7 on the Oswego and 4 on the Cayuga and Seneca. The standard length of lock chamber is 310 feet at the center, but 10 feet of this is taken up by the concaved lower face of the wall bounding the upper end of the chamber. The distances between gates vary with certain conditions, the least being about 338 feet. The locks are 45 feet wide in general and have 12 feet of water over the sills. The maximum parallelogram which can be passed through all the locks would be 300 feet long by 44.44 feet wide. There are two guard-locks, one on each side of the crossing of the Genesee river. These locks have lift gates, placed 311 feet apart, which are of the same type as the guard-gates. They have the usual width and depth of water, 45 and 12 feet, respectively, but no normal lifts.

The Barge canal locks are built of concrete throughout, both side and cross walls and floor. At a few points, where favorable rock was encountered, the concrete floor has been dispensed with. The side walls are 5, 6 or 7 feet wide at the top, according to local circumstances, and vary in height and bottom width with the lift of the lock and certain other conditions. In some cases, where one side of a lock is exposed to a river channel, the top width is increased to 12 feet. The lifts range from 6 feet to 40½ feet. Both the differences of lift and the fluctuations between normal and high navigable stages govern the heights of the side walls, which vary from 28 feet to 61 feet, with an extreme at one point of the lock at Little Falls of 80 feet. The bottom widths of these walls, which range between 13 and 34 feet, are determined by the height of the walls, the nature of the foundation and certain incidentals of design at each lock. Unless a rock or hardpan foundation could be obtained, piles were driven under practically all locks.

Within each side wall runs a culvert for filling and emptying the lock. The culverts are connected with ports that open into the chamber at the bottom of the walls. These culverts vary in size, the dimensions being 5 by 7 feet for locks of 12 feet lift or less, 6 by 8 feet for lifts between 12 and 23 feet, and 7 by 9 feet when the lift is 23 feet or more. Connected with the 5 by 7 culverts are 16 ports, 8 on either side, while the number is increased to 22 with

the 6 by 8 culverts and 28 with the 7 by 9 size. The ports have been made both by imbedding cast-iron pipes in the concrete and by leaving rectangular openings in the walls, the latter being the later method. The area of opening in either case is about $7\frac{1}{2}$ square feet each.

In some of the locks there is another culvert through one of the side walls — a feature of the hydro-electric development for operating and lighting the locks. Local conditions and the proximity of two or more locks have determined where these power-plants shall be placed. At some points one plant serves several locks, as at Waterford, where a series of five locks and two guard-gates receive power from the plant at Crescent dam.

The lock gates are of the mitering, girder type, carrying the principal load as beams. In general they are built of steel, with single skin-plates, but have white oak quoin and toe posts. The quoin post swings on a cast-steel pivot, set in the concrete, and is held at the top by an adjustable anchorage. The bearing is against cast-iron quoin plates set into the side walls. Wooden gates are employed at three locks.

The lock gates are each opened and closed by a steel spar equipped with a rack, actuated by a 7-horse-power motor acting through a train of gears. This spar is also equipped with a heavy coil spring, to absorb shock. To open or close the gates requires about one minute.

Movement of the gates is controlled from four operating stands, one near each gate. These operating stands are equipped with drum type master switches, by means of which magnet type controllers automatically regulate the acceleration and speed of the motors. Limit switches are provided to arrest the motion of the gates at each end of their travel.

Signal lights indicate to the operator the position of the gates. In the event of failure of power or damage to the motor, it is possible to disconnect the motor and operate the gates by hand by means of sweeps provided for this purpose, which have been so designed that but two men will be required for such operation.

The valves regulating the flow of water in the culverts are suspended on two chains, which pass over chain wheels near the top of the valve wells to cast-iron counterweights. The chain wheels are mounted on a shaft rotated by a motor operating through a train of gears designed to raise or lower the valves at a speed of about six feet per minute.

The motors of the 5 by 7 and 6 by 8 valves are rated at 3 horse-power while those operating the 7 by 9 valves are rated at 7 horse-power.

The movement of the valves is controlled in a manner similar to the movement of the gates and the master switches are located on the same operating stands. Signal lights indicate to the operator that the valves are fully open, two-thirds open, one-third open, or closed. Like the gate machinery the valve machinery may be operated by hand whenever this is necessary or desirable.

Electric capstans, one at each end of each lock, are provided to control the movement of boats along the approach walls and to tow them into and out of the lock chamber. A 20-horse-power motor operates each capstan at a speed of about 60 feet per minute with a pull of 8,000 pounds. The operation of these capstans is controlled by a magnet type controller and master switch located near the capstan.

All the motors incorporated in the lock operating machinery are of the mill type.

In general a power generating station has been installed for each lock. But if two locks are close together, one station suffices for both. In one instance a single station supplies power for five locks. These power stations, constructed of reinforced concrete, 20 by 30 feet in plan and about 20 feet high, are placed adjacent to or near the various locks.

The Barge canal has two or three noteworthy locks. In the city of Oswego there has been constructed a siphon lock — the only lock of this type on the Barge canal, also the first to be built in this country and the largest employing the siphon principle yet built. The general design of the culverts is similar to that of a lock of ordinary type, except that at the upper and lower ends the culverts are curved up so as to form necks, or crowns, which rise a little above the highest water-level and which at the same time are shut off from all communication with the outer air except through the operating pipes. The flow of water is started in the siphons by means of tanks, one being built in each wall near the upper end and communicating through pipes with the upper and lower levels and with both siphons in the same wall and being shut off from all other communication with the outer air. To perform an operation the tank is first filled with water; then the intake valve is closed and the outlet opened. There results a body of water suspended by its weight but tending to escape into the lower pool, thus producing the necessary vacuum. On opening the air valve, air from the siphon rushes into the vacuum

and water begins flowing over the crest in the neck. Using both siphons the lock chamber can be filled in from $4\frac{1}{2}$ to 5 minutes, while it can be emptied in from $5\frac{1}{2}$ to 6 minutes. It has been found that the draft of the siphon is such that soon after the flow has started the direction of the air is reversed and the vacuum is restored in the tank. Thus the operating power is self-renewing and, except for air leakage, lockages can be conducted by merely manipulating the 4-inch air valves.

At Little Falls there has been built a lock notable for its high lift — $40\frac{1}{2}$ feet. The lower gate of this structure is of the lift type — the only instance of lift gate on any Barge canal lock, except the guard-locks at the Genesee river crossing and the upper gate of the Utica terminal lock. Another novel feature at this lock is the side pool. Its purpose is to conserve the water-supply by storing water drawn from the upper half of a chamberful and discharging it to fill the lower half of the chamber at the next lockage. Still another unusual feature at this lock is the masonry across the chamber from side wall to side wall at the lower gate, under which boats must pass in entering the lock from below. At the time of beginning construction this was the lock of highest single lift ever undertaken in the world. This structure takes the place of three locks in the waterway which the Barge canal has just superseded. Before the original State canal was built a private company essayed to improve navigation at Little Falls, beginning work in April, 1793, and using five locks to overcome the fall in the river. As it happens, a lock constructed by this company, although built about seven years later, is still standing. The contrast between these two in such close proximity, the pigmy and the giant of New York canal history, is most striking. An excerpt from a report the directors of this company made to the Legislature in 1796 brings out this contrast. The facts are as interesting as the language is quaint. "Five locks," reads the report, "having each nearly 9 feet lift are placed towards the lower end of the Canal, and the pits, in which they are placed, have been excavated out of solid rock, of the hardest kind; the chamber of each lock is an area of 74 feet by 12 feet in the cleave, and boats drawing three feet and an half of water may enter at all times."

On the earlier State canals the building of two or more locks end to end was not unusual. Combined locks they were called in those days. On the Barge canal there are only two instances of such locks — tandem locks they are now generally termed. The more conspicuous of these is the pair at Lockport. Prior to Barge canal

construction there were ten locks at Lockport, two flights side by side of five locks each. The southerly flight has now been demolished and two locks of Barge canal dimensions have been built in its place. The site of the locks at Lockport, from the time of the original canal to the present, has never changed. The early engineers found the logical location for locks in this vicinity and the same place has been in use ever since. The romance of ancient geological happenings attaches to this site. Where the locks now stand the rushing waters from the Great Lakes once poured, falling over a precipice and excavating the gorge through which the canal passes in its course to the east. In that far-off past this waterfall and gorge, formed by the floods from the interior, were a lesser counterpart of the great Niagara cataract and descended the same declivity, the formation known in geological phrase as the Niagara escarpment.

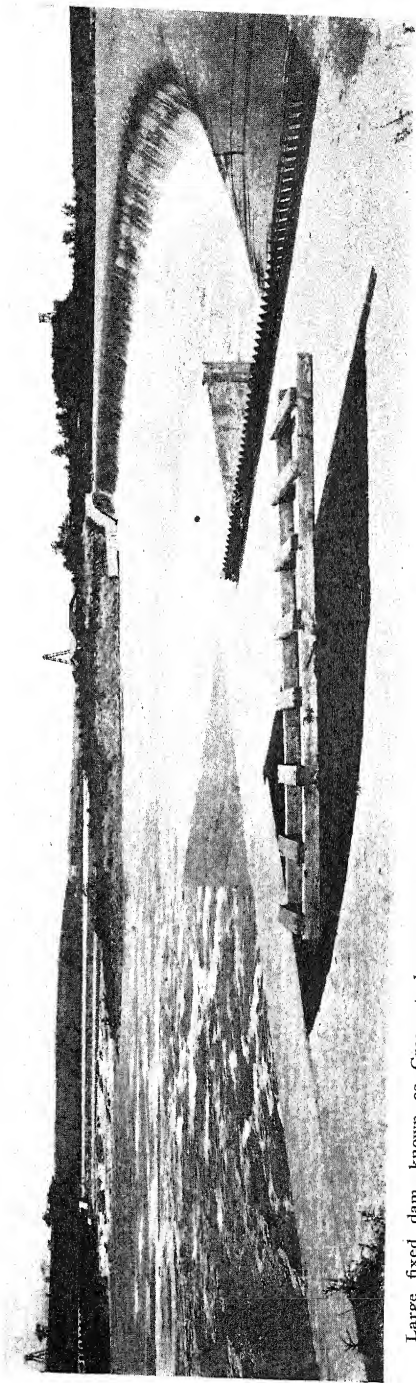
The two new locks at Lockport have a normal combined lift of 49 feet. At the upper end of the pair there are two sets of gates, one for emergency, since the canal level above extends to Lake Erie and these lock gates and the guard-gate at Pendleton are all that stand in the way of the waters of the lake again rushing over the precipice as in the bygone ages. We shall see in the next chapter that a large volume of water is fed from Lake Erie into the western half of the canal. Much of this supply is carried around the Lockport locks in a tunnel and incidently valuable water-power is created. This is used for manufacturing. It was the creation of power from passing canal waters which brought Lockport into being. Before the original Erie canal was begun there was not even a hamlet where the city now stands, but in less than a year after construction had commenced at this locality a sizable village had sprung up.

Aside from the locks, the dams are usually the most important structures on any canal. On the Barge canal, as well as on modern canals in general, the dams are peculiarly important. This is due to the fact that in the present-day development of waterways it is the practice to canalize the rivers. This condition is particularly true of the Barge canal, which as a whole is distinctively a river canalization.

There are four dams of the fixed variety on the Barge canal which are outstanding because of their size. Two are river dams, located in the lower reaches of the Mohawk, and two are reservoir dams. The dam at the lower end of Mohawk river navigation, called Crescent dam from the name of a near-by hamlet, is situated just below the point where the land line from the Hudson enters the Mohawk. This dam is curved in plan, but is of the gravity type,

not depending on its curved form for stability. This structure is made up really of two dams, with a rocky prominence intervening. One section spans the former river channel while the other crosses low land, which after completion was submerged. The entire structure sweeps through nearly a semicircle on a 700-foot radius, with a total length of 1,922 feet. Across the front of the dam built on the low land was constructed a third dam. This is lower in elevation and its purpose is to maintain a pool which may serve as a water-cushion to break the fall of water spilling over the crest and prevent erosion of the rock at the foot of the main dam. The pool back of the main dam has been raised some 27 or 28 feet above the former river level. This pool spreads out into a virtual lake. Indeed during the ceremonies attending the opening of this portion of the canal on May 15, 1915, Governor Whitman formally christened this body of water Lake Crescent. The crest of this dam stands 39 feet above the apron. At the base it is 42 feet wide and at the top, 11 feet 5 inches. The apron has a width of 40 feet. The masonry content is 54,360 cubic yards. At the eastern end, the end nearest the canal line, is situated the largest power-station as yet constructed on the canal. This station supplies current for operating the two guard-gates and the five locks of the Waterford series and for lighting this stretch of canal. At the western end there are provided head-gates.

About ten miles above the Crescent dam is the other large fixed dam of the canal, known as Vischer Ferry dam, this name also coming from a near-by hamlet. These two structures are much alike; the general design is the same and the dimensions do not differ widely. The site chosen for this dam was one having two river channels encircling an island of considerable size, which had steep shores and a rocky plateau-like top some twenty feet above the river. A dam was built in each of these channels, and connecting the two sections was a third section across the island, making one continuous crest of nearly two thousand feet. Each section is straight in plan and the trace of the whole structure is roughly that of a reversed letter Z. The crest of this dam is 36 feet above the apron; its bottom width is 40 feet 6½ inches, its top width, 11 feet 5 inches, and the width of its apron, 38 feet. It contains 58,750 cubic yards of concrete. With the immediately adjacent locks, one of Barge canal dimensions and 26 feet lift at one end and a temporary lock of old size at the other, the amount of masonry at this locality reached a total of 90,000 cubic yards. The small lock was needed to maintain navigation during a part of the time while construction



Large fixed dam, known as Crescent dam, at the foot of Mohawk river navigation. View from beside the power-house, showing the whole sweep of 1,922 feet of length, with the head-gates at the extreme left and the intervening island in the middle.

was in progress and before the new channel both below and above the dam was completed. This dam too forms a lake of considerable size.

Descriptions of the Delta and Hinckley dams, the two prominent reservoir dams, are given in connection with the chapter on water-supply and so need not be included here.

We desire to speak of three types of movable dam in use on the Barge canal. The first is the kind known as the bridge dam with Boulé gates. This type, however, was described so fully in our study of early canal policies that little need now be added. There are eight of these bridge dams on the lower Mohawk. These are situated at Scotia, Rotterdam, Cranesville, Amsterdam, Tribes Hill, Yosts, Canajoharie and Fort Plain. Four of them have two spans and four have three spans, the various lengths of span being 150, 180, 210 and 240 feet. The total lengths of these structures range from 370 to 590 feet and the depth of water between sill and upper level varies from 16 to 20 feet. For operating these dams steam winches were tried at first but now electric winches have been supplied. A part of the dam across the Genesee at Rochester is of this type. Bridge dams, but smaller in size, are also located at Mohawk and Mays Point.

The general principles which governed the designing of the bridge dams were these: To reproduce the natural area of discharge at each site, so as to avoid changing flood heights; to use high dams, so as to reduce their number and length and therefore their cost; to use few pieces, so as to concentrate the strength and reduce the number of pieces to be handled; to place a minimum amount of steelwork permanently under water, because of rusting; to make all parts of plain workmanship and similar as far as practicable, and to incorporate only such features as had been successfully adopted elsewhere or concerning the success of which there appeared to be no reasonable doubt.

Another type of movable dam of which there are many examples on the Barge canal is the Taintor gate. This has been used in a wide variety of ways—as a whole dam, as a regulating section in conjunction with a fixed dam, as a gate to fill a notch in a fixed dam, as a by-pass gate beside a lock, as a by-pass gate around a guard-gate, and as a crest across the top of a low fixed dam. An unusually large dam of this type has been built beside lock No. 1 of the Champlain canal, a short distance north of Waterford. It serves here as the regulating section in connection with a fixed dam and consists of six gates, each 50 feet wide in the clear and having

a vertical height of 17 feet above the sill. A single gate of still longer span is that at Whitehall, where it forms the movable crest on a low fixed dam and is operated from a highway bridge which crosses the stream at this point. The clear length of this gate is 90 feet. The four other most conspicuous examples of Taintor gate are those at Cayuga and Waterloo, where the gates constitute the whole of the structures that act as regulating works for Cayuga and Seneca lakes, respectively, and those at Phoenix and Fulton, where they form regulating sections in conjunction with fixed dams and regulate the Oswego river.

The Taintor gate is a sector gate and also it is the usual form of sector gate, but for the Rochester dam a somewhat novel adaptation of this type was devised, for which, however, a name no more distinctive than submersible sector gate has been used. In the sector type of dam, it may be explained to the non-technical reader, the movable portion, when viewed in cross-section, forms the sector of a circle, of which the arc is the upstream face. The movable part is usually constructed of steel, the face being a solid plate. This gate is attached to and moves between abutments, piers or other suitable forms of masonry. In the Rochester dam the sector gate is pivoted at about the level of the stream bed on the downstream side rather than above the water-level of the upstream side, as is the usual Taintor gate. In passing water through the ordinary type the gate is raised and the water flows beneath. At the Rochester dam the gate is lowered into a recess in the masonry and the water flows over it. The dam across the river at Rochester is made up of two types, the longer portion being a bridge dam. The reason for making a part of it of the sector type and of this peculiar kind of sector is the presence in the river of much flood wood. This gate at Rochester always presents an unobstructed crest to the water in whatever position it happens to be, whether fully raised or fully lowered or at any point between. It thus becomes a clear and free but adjustable spillway. So that debris may find no lodgement after it passes the crest, a deck is provided on top of the sector-shaped ribs which support the face of the gate, this deck forming an inclined plane, down which the water may flow, and simply changing its angle of slope with the raising or lowering of the gate.

Aside from the locks and the dams there are only two structures of which we desire now to speak, and one of these is really a type of dam. These are the siphon spillway and the automatic crest for a dam. Both structures are new in the field of engineering and were

developed in Barge canal design. The engineer who conceived them holds patents governing their use, but the State was not required to make any compensation.

The siphon spillway is a structure particularly fitted to localities where there is not room for the usual long overflow spillway but where it is essential nevertheless automatically to regulate the surface-level of a body of water within fixed limits and prevent it from rising much beyond a given elevation.

In many places the Barge canal receives the drainage from the land adjacent to its channel. As a widely fluctuating canal water-surface is to be avoided if possible, it has been necessary to get rid of any surplus, and if this water at times may flow in rapidly it must be discharged with equal rapidity. Where conditions permit, this has been accomplished ordinarily by a waste-weir of sufficient length of spillway to pass the required amount in a given time. But when the volume is large the spillway must be long and sometimes conditions exist which make a long spillway undesirable or even impossible. It was the presence of such conditions, especially at Whitehall, one of the places where a siphon spillway has been built, that led to the designing and introduction of this new structure. It is believed that in this structure the siphon principal was used for the first time to create a spillway of any considerable size. The siphon action is entirely automatic, in both the starting and stopping of the flow. The reduction in length between this structure and an ordinary spillway varies with the available head of water, but the several spillways of this type on the canal accomplish as much as the old kind from three to five times their length. The economy in cost of building the siphon type is also considerable.

As the name indicates, the surplus water is discharged through a siphon, or rather through the several siphons which are incorporated in each of the structures as they have been built on the Barge canal. These siphons are inclosed in a concrete wall, which, except for openings in its faces, differs little in outward appearance from any wall that might be built to separate two streams having different surface-levels. The siphon is simply a cavity in the wall. Its inlet is placed well below the surface of the stream to be regulated; its outlet is as low as the stream that carries away the flow will permit; its crown rises to the elevation at which it is desired that the discharge of water shall begin. On the canal the permissible surface fluctuations are not large, and as the siphon does not come into action until completely filled with water, it has been necessary to

limit the height at the crown to the range of fluctuation at each particular locality, the necessary area being obtained by increasing the width at the crown. The bottom of the crown is at the low-water level and at this elevation vents pierce the wall from outer face to siphon. When the water has been drawn down to this level, air enters through these vents and stops the flow through the siphon. A little below these vents a precautionary vent is placed, to break the flow in case the upper openings become clogged. These are the essential features of the siphon spillway. In designing one, however, there are other details to be worked out, such as the flaring of the inlet to reduce loss of head due to entry, a screen at the inlet to prevent the entrance of floating bodies, the development of the siphon dimensions from a wide and low crown to more nearly square inlet and outlet, forms which may be removed after the concrete is poured and an ordinary spillway to act as a drift gap and carry off debris.

The second of the two structures we mentioned is an automatic crest on a dam. Only one of this type was built on the Barge canal. The masonry portion is much like an ordinary low dam, with abutments rising several feet above the crest. The movable part runs lengthwise along the whole masonry crest and has a close-fitting contact with each abutment. It is made chiefly of wood and consists of two leaves set at right angles and hinged at their intersection to the top of the masonry crest. These leaves are L-shaped in cross-section, the upper leg being slightly longer than the lower. On the downstream side of the masonry crest, directly beneath the hinge, is a recess in the masonry, in cross-section the sector of a circle, into which the major portion of the movable crest may drop, the whole of it swinging down below the level of the masonry crest. The lower leaf is prevented from rising entirely out of the recess, being stopped by a projecting steel plate along its upper edge. Several openings through the masonry connect this recess with the water above the dam. The principle of operation is that of unequal water pressure against the two leaves, the leaves being properly proportioned and carefully weighted in order to make the action automatic. In picturing the crest in action we shall assume that water above the dam is at the level of the masonry crest and is rising. The pressure against the lower leaf has raised the movable crest as high as it can go. As the water rises, the pressure against the upper and longer leaf gradually increases until it becomes equal to that against the lower leaf. A little beyond this point and the crest begins to

swing down, going quickly once the water has begun to flow over. It drops completely below the masonry and allows the flood to pass before the pressure on the lower leaf raises it and brings it again into action.

In the western part of the state the canal in a few places is carried on the tops of rather high embankments. In these localities concrete troughs with bottoms and side walls of masonry have been built. These structures deserve a brief notice. Those constructed at first did not have the drainage features of the later style but otherwise were about the same. The trough was not designed to carry the whole weight of the water as an aqueduct would. Rather the underlying thought was to prevent serious breaks by not allowing leakage to get a start. The plan was very simple — just two courses of concrete in the bottom of the prism with a layer of screened gravel between. In the gravel were laid lines of drain tile every twenty feet and on top of the upper course of concrete tar felt waterproofing was placed. The side walls, well joined to the bottom courses, were about of standard design except that inspection chambers six and a half feet high ran through them lengthwise and at the side of these chambers was a channel into which emptied the lines of drain tile. The side walls were well backed by embankments at least 22 feet wide at the top and sloping down on a one on three slope.

Aside from the individual structures there are also numerous localities on the Barge canal which during construction have presented such complex and difficult problems that a record of the solutions is of considerable interest, especially to the engineer. We cannot now describe all places of this character, the list is too long, but briefly we may mention four — Waterford, Rome, Rochester and Medina.

In all the story of transportation west from the Hudson river there has always been the difficulty of getting out of the river valley and up the first stage of the ascent. The early highways made it by steep climbing or lengthened windings. The waterway which preceded the first State canal, lying mainly in the Mohawk river channel, stopped at Schenectady and depended on wagons to deliver goods from the Hudson. The original Erie canal had locks so close together that too frequent lockages set the boats aground. When the canal was enlarged the peril of grounding was overcome by longer levels, but still the many locks were a grievous trial to navigators and a hindrance to rapid movement. The first railroad mounted the acclivity by pulling its cars by ropes up a sharp incline

before it began the overland journey under power of its locomotives. Later a gradually ascending route was adopted, but the long years of using extra locomotives for pushing trains have borne witness to the difficult situation.

It was this problem of getting out of the Hudson river valley that lay at the bottom of selecting the Waterford route for the Barge canal. After the locks had been relocated and rebuilt during the first canal enlargement no improvement was attempted until the period of the nine-foot deepening, when plans were made for a high pneumatic lock, designed to take the place of the sixteen ordinary locks near Cohoes. But that improvement came to an end with nothing done towards building the lock. In the two surveys which followed almost immediately — the Deep Waterway and the preliminary Barge canal — routes either beside or very close to the Cohoes falls were the only ones considered. It was after engineering forces for constructing the Barge canal were organized and sent into the field for additional data that the route along which the canal has been built was discovered. This route, which makes the passage from the Hudson to the Mohawk through a land line about two and a half miles long is so far from the falls, at least a mile at the nearest point, that it had escaped serious consideration earlier. Its advantages were so marked, however, that it was speedily adopted. It follows a natural valley to within a short distance of its upper end, but thence, it passes through deep rock cutting. It enters the Mohawk above both the Cohoes falls and the dam of the Cohoes Company and also above the site of the new Crescent dam, which has created a pool above the land line for ten miles of river navigation.

Because the Waterford land line solved the problem of passing from the Hudson to the Mohawk and because its completed structures contain so much of engineering concern, it becomes a place of importance. On this short stretch a visitor may see more to interest him and a greater variety of structures than on any other portion of many times its length. The locks are not of the tandem variety, as the preliminary plans required, but have short pools between them. There are five of them and they constitute the greatest series of high lift locks in the world. The lifts vary from $32\frac{1}{2}$ to $34\frac{1}{2}$ feet and the aggregate is 169 feet. The distances between the locks are so short that the pools had to be widened, so as to store sufficient water for frequent lockages. There are by-pass channels around all of these locks. An interesting type of concrete docking borders the

channel in several of the pools. There are two guard-gates above the locks — to protect both the canal line and the cities below. Without these guard-gates, were some accident to destroy a lock gate or tear out an embankment, all the stored waters of the Mohawk might come pouring through. Before the unprecedented flood of March, 1913, only one guard-gate stood at the head of this line, but from the experiences of that time the State Engineer, who himself watched through one night while the flow reached its maximum, was led to build a second guard-gate. These gates have Taintor gate by-passes around them. There are other features of note along the Waterford line, such as the great Crescent dam, the power-plant at its end for supplying the whole stretch with electric energy, the transmission line with its concrete poles, the three power substations, the deep rock cut, the high retaining walls and the several bridges, both railroad and highway.

The preliminary Barge canal survey considered two routes at Rome, one through the southern outskirts of the city and the other directly through the city, following the line of the existing canal for much of the way. The northerly route provided for a level higher than the other by several feet. The southerly route was crossed twice by the New York Central railroad necessitating two long four-track bridges. When, prior to construction in this vicinity, it came to making a final decision as to routes, there were three parties to the conference — the State, the city and the railroad company. In most of its course through the Mohawk valley the railroad runs close to the north side. After crossing the old canal at Schenectady, it remained on the north side of the waterway as far west as Rome, where it crossed to the south side. The new canal, however, was to be crossed east of Utica and thence westerly the waterway could remain on the north side except for the possible crossing and recrossing at Rome. The northerly route, therefore, had the advantage of eliminating these two bridges, but it had compensating disadvantages. The canal question, however, was not the only one at stake. There were several railroad features, irrespective of the canal, which entered into the consideration. The railroad had to swerve to the north and back again for the purpose of reaching Rome, rounding a very sharp curve to accomplish it. The station was old and sadly needed rebuilding and moreover it was on the wrong side of the tracks, passengers having to cross freight tracks at grade to reach the coaches. Most of the city crossings were at grade. The problem, thus complexly involved, awaited solution for some time before an agreement satisfactory to all concerned could be reached.

Finally the southerly canal route was chosen, but the railroad line was changed also, being thrown to the south of the canal. This meant a relocation of several miles of road, but the company gained a much better alignment by the change. The canal too was changed from the line first contemplated, being carried straight west to an intersection with the old canal at New London instead of circling to the north and meeting it at Fort Bull. Thus both the canal and the railroad were straightened and shortened and were taken out of the built-up portion of the city. But the work involved in all these changes and new structures was enormous and Rome became a busy center of canal activity as well as a place where much of interest could be seen. So far as costs were concerned there were no large differences between the various solutions of the problem.

If we were to visit the finished canal at Rome, we would find several important structures. At this point the waters from the Adirondack reservoirs are received. These come down through the Black River canal to the Delta reservoir, where a new and large impoundage has been provided for the Barge canal. Thence the augmented supply reaches the Rome level through the Mohawk river. The whole flow of the river is taken into the canal at this point. A retaining dam lies in the bed of the stream just above its entrance into the canal. Water not needed for feeding the land line sections to the east and the west is spilled into the old river channel over two spillways, one near-by and the other at some distance away, towards the easterly end of the level. This water, however, is utilized for canal purposes farther downstream, for the canal occupies the river channel throughout most of its course eastward to the Hudson. There is a guard-gate at each end of the section of canal carrying the whole river flow. When desired, these gates confine the feed water to this section — the common practice in winter and a possible action in all times of emergency. The new canal crosses the old at Rome, but at a lower level. Since it has been necessary to keep open both portions of the old canal, a junction lock has been built on each side of the new channel, allowing old-sized boats to lock up into the old canal in either direction. The section of old Erie canal to the west has become in effect a part of the Black River canal, being needed to furnish a connection between that waterway and the Barge canal. But instead of cutting off the old Erie immediately west of its junction with the Black River canal, it remains open to the western border of the city, where a dam across the old prism stops further navigation. The section of the old Erie to the east is the portion which was retained under the terminal law and origi-

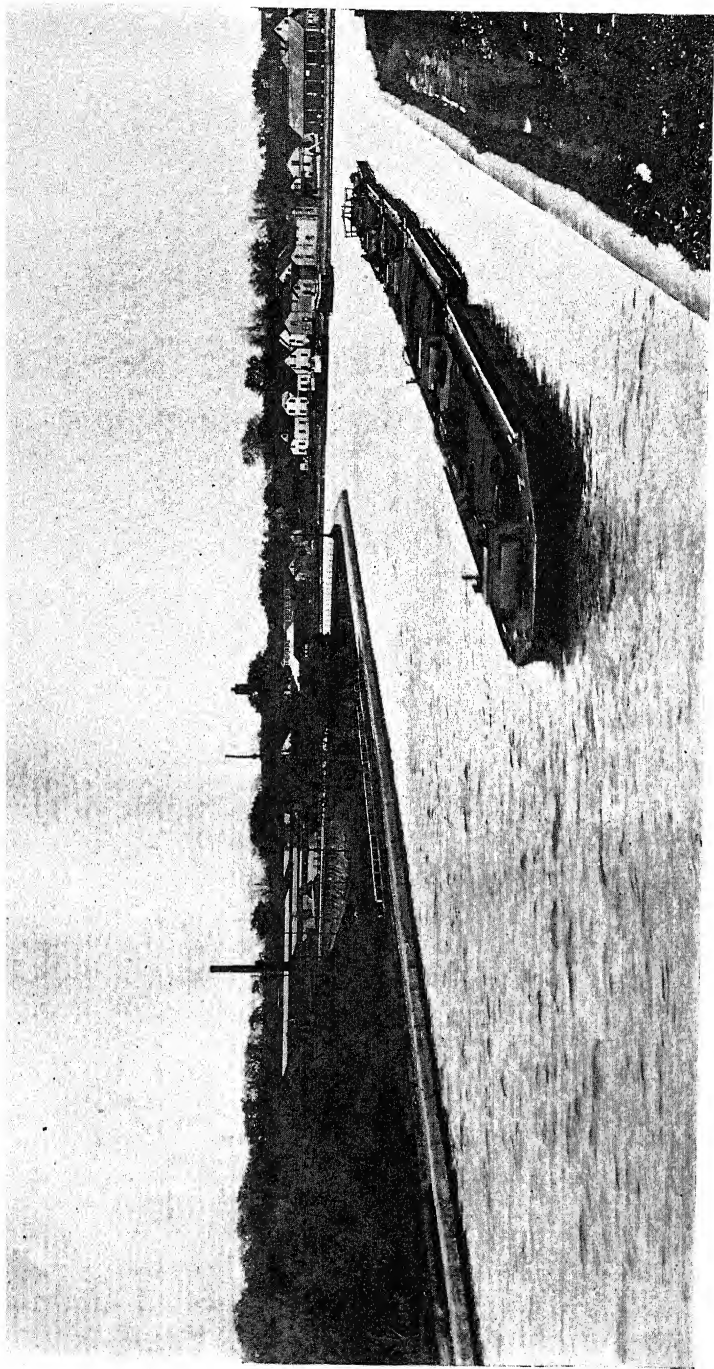
nally extended to Mohawk. A dive culvert, or inverted siphon, to feed this stretch, was built under the new channel at Rome. The detailed account of the Rome-Mohawk section is given elsewhere. Aside from the foregoing structures there have been a few bridges and some new highways and in connection with the railway relocation there was the long new road-bed and a modern station for the city.

The early canal was the chief factor in building up the remarkable chain of cities and villages that spans New York state. Later came the railroads and also many other influences to complete the work, but it was the canal that fixed the locations and gave both the initial impulse and the controlling impetus toward growth. Thus it is that we find the old canal running through the centers of large cities. When it came to enlarging the channel to Barge canal dimensions, however, it was clearly seen that the expense of building the new waterway through these crowded cities was prohibitive. This and other reasons have turned the channel to the outskirts of the municipalities wherever possible. So it was with Rochester. Several routes in this vicinity were studied during the preliminary survey, but the authorizing law laid down the route circling the city on the south about as it has been built except that amendments later put the spur to the city in the Genesee river rather than in the old Genesee Valley canal.

The work at Rochester was the last large portion to be undertaken. This was not because the engineering problems could not be solved nor because choice had to be made between routes, but the citizens were opposing what the State was attempting to do and it was years before agreements could be reached. The delay in coming to terms with the railroads also retarded progress. If construction had been begun earlier in this vicinity, doubtless the whole canal could have been opened earlier, or at least it could have been opened without such almost superhuman efforts as were actually required for the accomplishment. When State Engineer Williams assumed office in 1915 he perceived that the Rochester problem had to be solved speedily or it would block the whole canal scheme. He attacked it with determination and the result was that as soon as money was forthcoming to begin construction again after the exhaustion of funds the work at Rochester started. But we are not concerned now with details of construction or policy and moreover they are discussed fully elsewhere. The large and rather complex work in the vicinity of Rochester has engineering interest and that is the feature which is taking our attention just at present.

The problem at Rochester was this: The canal could not well pass through the city, but there had to be some way for boats to enter as close to the business center as possible. A line somewhere along the southerly city borders appeared to be the most feasible route, and this in conjunction with a spur in the Genesee furnished access to the city. Except for complicated details this part of the problem was simple and had to be solved in accordance with certain specifications in the law. But the route to the south which seemed best, all things considered, involved passage through a city park, deep cutting in both earth and rock, high embankments, and six railroad crossings. Also the spur line in the river was bordered on each bank by a railroad, and moreover the river was subject to unusually high floods. It was the park, the railroads and the flood conditions that presented the more difficult engineering problems, but none of these was really serious, once the way was cleared for action.

By taking scrupulous care the engineers have not allowed the canal to spoil the beauty of the park. Ornamental bridges, both foot and highway, span its waters. Spoil-banks have been graded, fertilized, seeded and sodded. Dikes border the river and drains care for any possible seepage. A guard-lock stands on each side of the Genesee river crossing. The bulk of the work has been along the river, where long, high walls line the banks, and the railroads have been altered to fit changed conditions, a new passenger station having been provided in one instance. A commodious terminal, at the end of the spur, is in the very heart of the city. A convenient approach to the terminal was a work of considerable size and involving some interesting structures. The walls along the river have been built high enough to overtop any known flood, but to make assurance doubly sure provision has been made for placing flash-boards upon them in case of need. A movable dam at the lower end of the spur maintains the proper water-level for both the spur and the main canal at the river crossing. This dam is made up of two types, the bridge dam and the submersible sector gate, both of which have already been described. The new dam is situated a little below an old dam, which has been left intact. When the new dam is not in operation, former conditions, except for deepened channel and wall-lined banks, will be exactly restored. During construction, for the purpose of maintaining navigation, a temporary dam in the river and a temporary lock in the old canal west of the city became necessary.



Channel circling the deep gorge at Medina, behind a wall having a maximum height of 45 feet; in effect running behind a high dam for nearly a third of a mile. The outer face of this wall appears in the distance; in part it flares to an overhang, giving a top width of 15 feet for a passageway. To compensate for sharp curvature the channel reaches a maximum width of 300 feet. Frame terminal warehouse at the extreme right.

Because of the difficulties involved in the problem of crossing Oak Orchard creek in the village of Medina, a short stretch of canal in this vicinity became one of the most interesting portions of the whole line and received a greater amount of study than any other section. The old canal passed this locality by following a sharp horseshoe curve. Just below the canal crossing the creek descended a steep declivity and its valley widened into a gorge which, at the point where a direct line would cross it in connecting the straight stretches of canal on either side, was 500 feet across at the top and 90 feet deep.

To have carried the new canal across this gorge would have secured excellent alignment, but the plan involved serious difficulties. All of the early studies, however, contemplated some method of crossing along the straight line. Soon after the Barge canal was authorized, two tentative schemes were considered. One was by means of an earth fill, on which was to be a channel of standard embankment section. This plan gave an extremely wide fill and was not given very serious consideration. The other method was by means of a steel trough supported by steel trestlework resting on concrete piers. Plans along these lines were not worked out so carefully as were those of the later studies. When, after a little while, the consideration of this locality was begun in earnest, complete plans and estimates were made for seven schemes. A comparison of these methods and their relative costs is of interest, especially to the engineer, since it shows the advantages of a concrete over a steel structure and also that both of these are cheaper than an earth fill.

The seven schemes and their costs, which included simply the length of canal across the gorge, were as follows: (1) A steel cantilever structure with a steel trough for the canal, which was estimated to cost \$500,000. (2) A three-hinged steel arch of 300 feet span, center to center, carrying a steel trough for its length of 300 feet, the approaches of about a hundred feet on either side being concrete troughs supported on short concrete arches. The estimated cost was \$405,000. (3) The same steel arch and trough, but with approaches built all of steel, the cost being \$407,000. (4) A concrete arch in place of the steel arch, the remainder of the structure, both trough and approach supports, being of steel, at an estimated cost of \$300,000. (5) An all concrete structure, consisting of a plain concrete trough on a concrete arch of 300 feet span, center to center, which was estimated at \$272,000. (6) The same concrete structure, but with architectural adornment, which would raise the

cost to \$285,000. (7) An earth fill over a long culvert, the canal to be carried in a concrete trough, estimated to cost \$433,000.

After careful consideration the sixth scheme was adopted for making detail plans on which to let a contract. The reasons for the choice were, briefly, that this concrete structure was considered to be the safest, the most permanent, the cheapest to build, the cheapest to maintain and the most pleasing in appearance. Complete contract drawings were made and for some time it seemed that the canal would be built in accordance with these plans. In developing the plans the arch was made a little shorter than in the tentative scheme. The dimensions of the proposed structure, however, are given in the chapter on canal construction and need not be repeated. A full description is given there also of the careful tests made on model arches in order to ascertain beyond doubt, before undertaking construction, that so novel a venture would not fail. It was told too that, although the tests proved the stability of the structure, it was finally decided to build the new canal along the old alignment.

But before this final decision was reached another scheme was considered, that of crossing the gorge on a rock fill. This fill was to be made of quarry spalls, which could be obtained cheaply from near-by. On its top there was to be a cushion of earth and a concrete trough backed by small earth embankments. The estimates showed this project to be about \$90,000 cheaper than the concrete arch, but plans were never worked out in careful detail.

The canal as it finally was built in this vicinity embodies several interesting engineering features, the most important being the long stretches of retaining wall, some of it unusually high, and the aqueduct over the creek. Although the extent of canal under this contract was only two and a third miles long, there was on the north side one continuous stretch of retaining wall nearly seven thousand feet long while on the south side two pieces together measured about forty-six hundred feet. Between fifteen and sixteen hundred feet of the north wall was high, extending in some places well below canal bottom, to the natural surface as it sloped down toward the gorge. Here the bed of the canal is a rock fill and the wall beside the channel sustains hydrostatic pressure for its full height, which reaches a maximum of 45 feet. Thus in effect the canal runs behind a high dam for nearly a third of a mile. As a preventive against leakage at this high wall a vertical plate of steel was embedded six inches in each of two adjoining sections at the joints formed in construction.

The aqueduct, while it is not spectacular like the proposed long structure and has a span of only 50 feet, still is the longest aqueduct on the new canal. The arch ring has a thickness of three feet at the crown and of 6 feet 10½ inches at the springing line. The rise is 12 feet, the radius of the intrados, 32 feet, and that of the extrados, 49 feet. The clear width of channel between side walls is 125 feet. So as not to interrupt navigation the old aqueduct had to be torn out and the new one built in one winter season, and of course concrete had to be kept from freezing until all danger of injury had passed. An outstanding feature of this structure was the care taken to prevent leaks. Steel plates similar to those used in the high retaining walls were embedded at all joints, both those between the several arch rings and those between the rings and the side walls or the skew-backs. Also the top of the arch was covered with a waterproofing of tar felt and pitch which was joined to the side walls in a rather novel fashion, to prevent it from cleaving off. Into rectangular grooves left in the side walls a few inches above the arch the edges of the waterproofing material were tucked and then the grooves were filled flush with concrete.

The descriptions of engineering features connected with the Barge canal could be continued interminably and perhaps with profit to an interested engineer, but those already cited must suffice for the present volume.

CHAPTER XXIV

THE WATER-SUPPLY

General Scheme of Supply—Discussion of Water-Supply Requirements for a Canal—Supply for Western Portion of Erie Canal—Supply for Rome Summit Level—Old Sources of Supply for Rome Level—A New Source, Delta Reservoir—Its Characteristics and Size—Another New Source, Hmckley Reservoir—Its Characteristics and Size—Still Another Source Considered—Supply for the Champlain Canal—Supply for the Oswego Canal—Supply for the Cayuga and Seneca Canal.

THE PLANNING of an adequate water-supply for a canal as large as the new waterway system in New York state, while not the most difficult task, was one which required thorough and extended study. This task was much simplified, however, by work which had preceded it, for during the many years of the old canals the State had been building up a large system of reservoirs and feeders and with but few exceptions these were retained for the new canals.

Throughout considerable portions of their length the several branches of the Barge canal utilize existing natural streams, making them canalized rivers, and in general the ordinary flow of these streams is sufficient to maintain the requisite depth of water in the levels between the locks and also to supply the water required for lockage and incidental purposes. In other portions of the route the canal follows what are called low-level lines, using the stream valleys although not always lying actually in the stream beds. In this respect the new canal differs from the old, which as a rule was built on a level somewhat above the streams that it paralleled throughout most of its length. The adoption of these low-level and canalized-river lines also greatly simplified the problem of water-supply, but they were not chosen for that reason alone; they have other advantages and these were uppermost in prompting their selection.

Water is required in operating a canal for six main purposes, namely, to fill the canal prism, to fill the lock chambers, to provide power for operating lock machinery, to provide power for lighting the vicinity of the locks, to replenish loss due to unavoidable leakage through gates, culverts and turbines at locks, and to replenish loss in the levels between the locks.

In discussing these purposes it may be said that an independent water-supply for filling the canal prism is needed only in land lines and then only at the opening of navigation or after water has been drawn from the levels for some reason, such as making repairs. In river lines the natural flow of the stream will of course fill the prism.

Next in importance to filling the canal is the use of water for lock operation. A canal is essentially an inland transportation line in which the grades are overcome by water-power. That the energy is applied through the buoying power of the water makes it no less an application of water-power. Considering the mechanism that would be necessary to lift a boat mechanically without a lock, it is probable that by this means there would be attained little if any greater net efficiency than that secured by the usual lock. In addition the lock has the advantage of simplicity, quick operation and avoidance of strain on the boat. There may be a waste, of course, occasioned by the order in which boats pass a lock. If they go up and down alternately, then one lockful of water will suffice for lifting one and lowering the next. If boats run in the same direction in sequence, then a lockful is required for each boat or each fleet of boats going up or down. But even allowing for the waste of energy in lowering boats when a separate filling or emptying of the lock is required, the canal lock is a fairly efficient water-driven machine.

The amount of water required for a lock varies not only with the height of the lift but also with the amount of traffic. And for a given amount of traffic the water-supply varies according to the size of boats, since large and small boats use an equal amount of water for lockage, and also according to the manner in which they pass the locks, whether singly or in groups and whether lockages in the same direction are made in sequence or alternate with lockages in the opposite direction.

Of the third and fourth purposes of the water-supply, those of providing power to operate and also to light the locks, little need be said in amplification. The old locks were generally hand-operated, but for a large, modern canal such method can be considered only in the exigency of disabled electrically-driven machinery. In studying the Barge canal problem it was found best to provide a separate source of power at each of the locks, except in the few cases where locks are so near together as to be easily supplied from one power-plant without long transmission lines.

The loss of water in the levels between locks occurs chiefly in the land lines and includes seepage through embankments, waste

over spillways, evaporation from water-surfaces and transpiration through aquatic plants. In the river lines there is no loss over spillways and little from seepage.

The critical points in supplying water to canals are usually the summit levels. Although lower levels may demand more water, it is usually more readily obtainable. Proceeding downward from a summit the supply required at any lock may be taken — to use mathematical terms — as the sum of the losses between the source of supply and the lock, plus the water needed at the lock, minus the natural inflow between source and lock. Thus it appears that the necessary supply may vary greatly from point to point. In providing water for a summit level it is necessary, therefore, to obtain a supply adequate for the points of greatest demand on both sides of the summit. Generally speaking the lock of highest lift is the point of greatest demand. Whether the lock of highest lift is near to or remote from the source of supply, and the volume of intermediate losses or acquisitions, govern the amount that must be supplied at the summit.

From this description it is seen that the problem of estimating the water-supply for the Barge canal was rather complicated and embodied several indeterminate factors. It was necessary, therefore, to allow a liberal excess, or reserve, as a factor of safety.

On the new Erie canal the descent is downward from Lake Erie to the confluence of Seneca river, which flows from the west, and Oneida river, which comes from the east, where they join to form Oswego river and run north into Lake Ontario. From this junction of Seneca and Oneida rivers, called Three River Point, there is a rise to a summit level that stretches between New London and Whitesboro and is known as the Rome summit level. Thence easterly there is a descent to the Hudson river. It is seen, then, that there is one true summit level, that at Rome, and one half summit, that extending easterly from Lake Erie.

The largest independent supply required for any portion of the Barge canal is that needed at the western end. Fortunately an almost unlimited supply is available by tapping Niagara river at Tonawanda. The lock of highest lift that is fed from this source is located near Pittsford, a little east of Rochester. It is necessary, therefore, to draw enough water from the Niagara river to operate this lock after allowing for the loss and waste in nearly one hundred miles of canal. Sufficient water from the Niagara to furnish an adequate supply at the Pittsford lock, however, is enough for the tandem locks at Lockport, which have a combined lift of forty-nine feet.

In order to carry the water in requisite volume easterly from Niagara river it is necessary to give the canal bottom the proper slope in the levels between Tonawanda and Lockport and between Lockport and Rochester. In doing this provision has been made for carrying at least 1,237 cubic feet of water per second. It has been proved in both theory and practice that a moderate current in the direction of greatest traffic in a canal is advantageous. The eastward current resulting from the flow of Niagara river feed-water through the western portion of the canal is about two-thirds of a mile an hour. As the greatest traffic on the Barge canal is east-bound, the current at the western end is beneficial as well as unavoidable. With the ample water-supply from the Niagara river it is unnecessary to draw any water from former feeders in this territory, such as the Oak Orchard creek at Medina and the Genesee river at Rochester.

Although the amount of water required for the Rome summit level is less than that for the western section, the difficulties of securing an adequate supply are greater than for any other portion of the Barge canal. Throughout the existence of the State canals this part of the system has always presented the most difficult problem in water-supply and thus has led to the building of numerous reservoirs among the hills to the south of the canal and also within the Adirondack region on the north. A potent factor in determining the question in 1836 of building the Black River canal was its ability to bring the waters of the northern forests to the needy Erie, the very name given by law — The Black River Canal and Erie Canal Feeder — indicating one of its chief functions. As we have said elsewhere, doubtless this canal would have been abandoned along with the other laterals but for its necessity as a water-supply feeder. Because of this difficulty in supplying water there have been attempts in later years to eliminate the Rome summit level and these have caused investigations to be made for a line of continuous descent from Lake Erie to the Hudson, but all construction along such a line has seemed too costly to be practicable.

The Rome summit level of the new canal extends from lock No. 20, near Whitesboro, to lock No. 21, which lies between the hamlet of New London and Oneida lake. The Rome summit level of the old canal reached from Utica to Syracuse and was about fifty-six miles long. Its elevation was nearly ten feet higher than that of the new level. The use of the shorter summit at a lower elevation reduces the difficulties attendant upon securing an adequate water-supply.

It happens that a lock of 21 feet lift is situated near the easterly end of the new Rome summit level. Water sufficient for operating this lock, together with the natural supply drawn from the Mohawk river and its tributaries, is adequate to operate the canal throughout its length easterly to the Hudson river. At the westerly end of the summit the canal descends through two locks, each of 25 feet lift, down to the level of Oneida lake, so that a supply sufficient for the terminal lock is all that has to be provided in that direction.

The sources of supply for the new Rome level include substantially all of those used for the old level and two new sources in addition. The old supply north of the canal came from the headwaters of the Black river above Forestport. The waters reached the Erie canal through a feeder to Boonville and the Black River canal thence to Rome. Whatever water was spilled in this passage was caught in the Mohawk river and delivered to the Erie through a short feeder, also at Rome. For supplying the new canal there have been retained the Black River canal, the Boonville feeder and the system of reservoirs above Forestport. The Mohawk river feeder at Rome is no longer needed, since the whole river is taken into the canal and carried for several miles.

The old sources south of the canal are also retained. These consist in part of streams which the old canal crossed — Oriskany, Oneida, Cowassalon, Chittenango, Limestone and Butternut creeks. To secure this supply, diverting dams and feeders had been constructed and on the headwaters of some of the streams reservoirs had been built. After the Chenango canal was abandoned some of its water-supply, which came from reservoirs on the headwaters of the Chenango river, a part of the Susquehanna drainage basin, had been retained, reaching the Erie canal feeders through diverting channels. This source is among those retained for the Barge canal. To bring water from these sources on the south to the new canal it has been necessary to retain as a navigable feeder that portion of the old canal which lies between New London and the Orville, or Butternut creek feeder, which is situated only a few miles east of Syracuse. A new junction lock at New London connects the two waterways.

The new sources of supply, developed in connection with the Barge canal construction, are the headwaters of the Mohawk river and the West Canada creek. The Mohawk, to be sure, under the old arrangement could be diverted to the canal through the feeder at Rome, but as there were no storage facilities, only so much was available as the natural flow of the stream happened to furnish at

any particular time. The building of reservoirs on these headwaters has added two new lakes to the map of the state. Large artificial lakes, built for the supply of navigable canals, are relatively few in number and, if we ignore works like the Indian River lake, partially natural bodies of water, we are not aware of any in existence comparable in size with those constructed at Delta and Hinckley for the use of the Barge canal. But notwithstanding this fact the basin at Delta holds less than one-twentieth part of the capacity of Salt river reservoir, in Arizona, and covers little more than one-third the area of the Ashokan reservoir of the New York city water works. The Ashokan reservoir, by the way, wiped out seven villages, while Delta reservoir covers the site of only one.

The waters of the upper Mohawk are held in storage at Delta reservoir, or Delta lake, as the people of the vicinity prefer to call it. This is situated about five miles north of Rome and occupies a basin formed by an enlargement of the river valley just above a rock-walled gorge, the base of which is about six hundred feet wide at the site chosen for the dam, while its eastern wall, against which the river formerly flowed, rises precipitately and attains in places a height of one hundred feet. This bluff was known locally as the "Palisades." The hills surrounding the basin are arranged on the general scheme of a triangle with one vertex pointing upstream and this suggested to the first settlers the triangular Greek letter delta, the name they chose for the village the reservoir has now submerged. The waters of the new reservoir bring out even more conspicuously than did the hills this peculiar shape of the valley.

It is of interest to notice that in building the Delta reservoir the engineers were merely restoring an ancient glacial lake. In this respect it is like many of the natural basins which have been reoccupied by reservoirs in modern times. Before the reservoir was filled some of the shore lines of the ancient lake were very easily discernible. Excavations for the dam disclosed a buried gorge, pot holes and other evidences of the erosion of the glacial period.

The dam which holds back the waters in this reservoir is about 1,100 feet long, with a spillway 300 feet long near its center, and has a masonry content of about 90,000 cubic yards. Its height is a hundred feet from crest to lowest foundation. The concrete apron is ten feet below the river bottom, so that a permanent pool of that depth is maintained to act as a water-cushion to break the erosive force of the water in its fall of about seventy feet to the surface of the pool. The reservoir has an area at crest level of $4\frac{1}{3}$ square

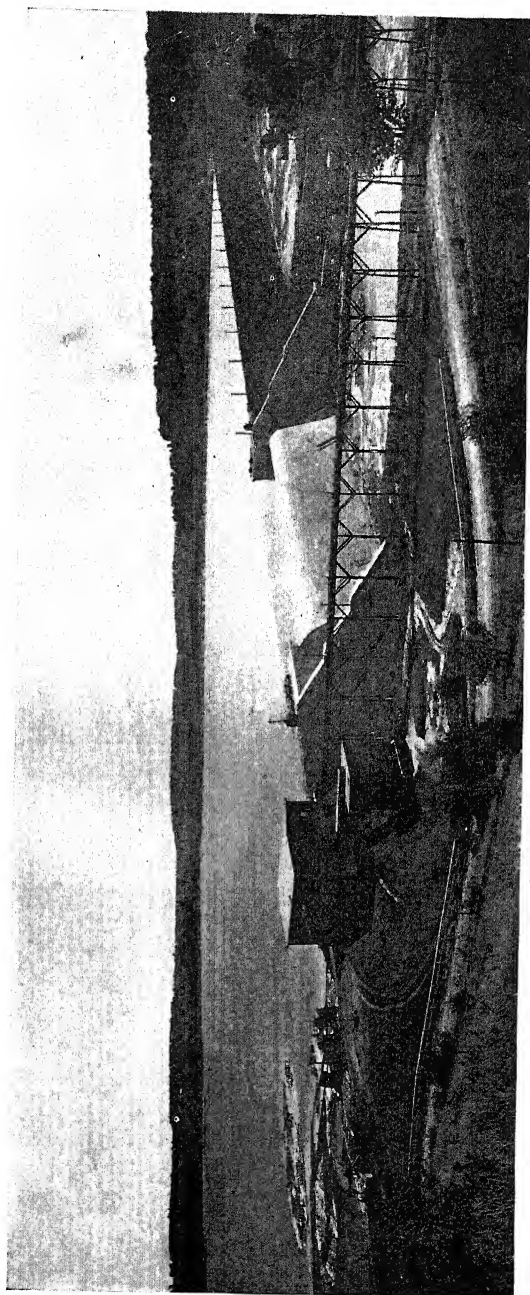
miles, a maximum depth of 70 feet, an average depth of 23 feet and a capacity of 2,750,000,000 cubic feet. The area of the tributary watershed is 137 square miles. The reservoir submerged ten miles of highways, seven canal locks and one aqueduct and required the removal of 295 buildings. The relocation of nearly two miles of the Black River canal, including four new locks and an aqueduct, was necessary. Incidentally the reservoir has considerable influence in mitigating disastrous flood conditions in the lower Mohawk valley.

The second of these two new sources of supply is West Canada creek. This stream reaches the Mohawk valley in the vicinity of Herkimer, too far below the Rome summit level to be of any material use. To make it available where needed, therefore, a diverting channel about 5.7 miles long takes the water after it has come from the impounding reservoir some five miles by way of the creek and turns it across a rather low divide into the channel of Nine-Mile creek, whence it flows by natural stream to the Barge canal, reaching it near Oriskany.

The reservoir, which is known by the name of the village near which it is situated, Hinckley, is about twenty miles north of Utica and lies in the foot-hills of the Adirondack mountains. The topography of its watershed of 372 square miles is rugged and varies in altitude from about 1,165 to 3,100 feet above sea-level. The drainage basin of this creek, like that of the upper Mohawk, is located in the region which has the maximum precipitation of the state, a precipitation which is exceptionally high during the winter months, in the form of snow.

No constricted gorge, where a short dam might be built, was available on the site of this reservoir. The dam has a total length of 3,700 feet, of which there is a 400-foot masonry section, embodying gate chambers and spillway. The major, or earthen, portion of the dam has a concrete core wall running through most of its length. The masonry content of the dam is 110,020 cubic yards, while there are 611,200 cubic yards of embankment in the earthen section. The masonry has a maximum height of 82 feet above rock and the overfall at the spillway is 61 feet. The maximum height of the earthen dam is 56 feet above the natural surface.

The reservoir forks into two parts, which have a combined length of about thirteen miles but no great width, only about a half mile. Its area is 4.46 square miles and its capacity 3,445,000,000 cubic feet. The maximum depth at crest level is 75 feet and the average depth, 28 feet. It necessitated the removal of 209 buildings, which made



Dam at Hinckley reservoir,—on the headwaters of West Canada creek. The impounded waters reach the Rome summit level of the canal after a passage of nearly 20 miles and a transfer from the West Canada to the Nine-Mile creek watershed through an artificial diversion channel. The long portion in the view is the earthen section; nearer are the masonry spillway and gate chamber. At the near end appears a runway for logs.

up parts of three villages, and it submerged seven miles of highways. This reservoir too is of much value for flood regulation, the maximum rate of flood discharge being very materially reduced.

During the early stages of study for the Barge canal water-supply a third new source was considered and careful surveys were made. The site of the proposed reservoir was at High Bridge, Onondaga county, on Limestone creek. But as the studies progressed it became apparent that the canal would not need an added supply from this source and so the plan was dropped, to be taken up again if necessity requires.

The water-supply for the other enlarged canals, the Champlain, the Oswego and the Cayuga and Seneca, presented problems of little moment. The Champlain canal has a summit level on the divide between the Lake Champlain and Hudson river basins. The corresponding summit of the old canal has been supplied by a feeder twelve miles long, which takes its water from the upper Hudson. This same feeder, the Glens Falls feeder it is called, after some improvements, supplies the needs of the northern portion of the new Champlain canal, while the southern portion lies in the channel of the Hudson river.

The Oswego canal begins at Three River Point. Here Oneida and Seneca rivers unite, bringing their natural flow and also part of the supplies from the Rome level reservoirs and Lake Erie. As the canal is chiefly in the Oswego river, its needs are much more than met by the natural stream flow and the added Erie supplies which reach Three River Point.

Seneca and Cayuga lakes, lying at the heads of their respective stretches of the Cayuga and Seneca canal, are natural reservoirs which not only supply all the water this canal needs but also augment the supply of the Erie branch between its junction with the Cayuga and Seneca canal and Three River Point.

CHAPTER XXV

THE ELECTRICAL EQUIPMENT

Radical Change from Former Methods—General Barge Canal Plan—Large Power-Plant at Crescent Dam—Plants at Locks: Vertical Shaft Type: Horizontal Shaft Type Gasoline-Electric Type: Details of Lock Equipment—Freight-Handling Equipment at Terminals—Grain Elevator Machinery Electrically-Driven.

WHEN in the progress of Barge canal construction it came to providing means for operating the several structures that require operation, mechanism propelled by other than hand-power was supplied, and this type of mechanism was employed as a matter of course. Moreover, equally as a matter of course, electric energy was chosen as the proper driving force both for these appliances and for the later freight-handling machinery. And this was all done with scarcely a thought of the mighty strides that were being made in changing from the canal which even then was but just going out of existence. But when we stop and recall the crude hand-operated structures and the various other devices of the superseded canal, we realize what a tremendous difference electricity has made in the new waterway. Our present canal depends on electricity for its efficiency almost as much as on the enlarged channel.

At each of the locks on a canal there exists a head of water and this circumstance makes it possible to install hydraulic power-plants at virtually all canal locks. Often it is necessary to pass water around a lock to supply the needs of the lower levels and in such instance power goes to waste unless there is present a plant to develop it. Also the cost of installing a plant at a lock is confined chiefly to the machinery, since conduits and wheel-pits may be formed simply by leaving cavities in the lock walls. Moreover the locks of today are too large to be operated by hand and thus it is that we find power-plants on all modern canals.

In general each Barge canal lock has its power-plant. There are 31 direct current hydro-electric stations and 11 direct current gasoline-electric stations, the latter being such as they are for reasons which will appear later. There is one alternating current hydro-electric station, and this serves five locks and two guard-gates. At a few locks power is purchased from a local power company.

The one alternating current station is situated at Crescent dam and furnishes power for the five locks and the two guard-gates on the land line between the Hudson and Mohawk rivers. This station contains three 75-kv.-a., 2,300-volt, 3-phase, 40-cycle, vertical generators directly connected to Francis inward-flow turbines. From the station a 2,300-volt alternating current is transmitted by an overhead line to three substations, one each at two of the locks and one at one of the guard-gates. At the lock substations the current is converted to direct current at 250 volts by means of motor-generator sets and is then distributed to the near-by locks. The substation at the guard-gate is supplied with transformers, control panels and controllers for two 25-hp. alternating current motors located on the guard-gate superstructures. The poles for the transmission line are made of reinforced concrete.

The 31 direct current hydro-electric stations are of two types, 26 of them having vertical shaft generators and 5 having horizontal shaft generators.

The equipment at one of the vertical shaft type consists of two head-gates, two Francis inward-flow turbines, each directly connected to a 50-kw., 250-volt, direct current generator, a switchboard consisting of two generator panels and one feeder panel, two motor-driven governor oil pumps, two oil pressure governors, a motor-driven oil pump and lubricating system, a traveling crane, four 4,000-watt electric heaters and an incandescent lighting system. At certain locks slight variations occur. If a station feeds two locks, the capacity of the generator is increased to 75 kilowatts and an extra feeder panel is added. If the second lock is less than a mile and more than half a mile distant, a booster set is provided, together with the necessary switchboard panel.

Where the head of water is so low that the turbine speed falls below 150 revolutions per minute, horizontal shaft generators running at a full load speed of 300 r.p.m. are connected to the turbines through bevel gearing.

At the locks beside which are movable dams the power-stations are of the gasoline-electric type. The movable dams are generally raised at the close of the navigation season, thus destroying the head of water and precluding its use when needed for lowering the gates. At each of these locks, therefore, there has been built a station having two 25-kw. gasoline-electric generator sets, with a closed cooling system and incidental electrical apparatus. Eight of these stations are at Mohawk river locks, where during floods the lock walls are

sometimes several feet under water. The power-stations, accordingly, are set well back from the river, on higher ground. In like manner the electrical equipment at these locks is housed in a concrete cabin nine feet high, built on the wall, where it is out of danger from flood. Vertical shafts with the necessary bevel gearing transmit the power from the motors in the cabin to the machinery located in the recesses in the lock below.

The parts to be operated at a lock are the gates, the valves and the capstans. Near each gate is located a master switch stand. A simple movement of the hand will set in motion the machinery for opening or closing the gates or the valves at the end of the lock near which the particular stand is located and this can be done from the stand on either side of the lock. On each stand are five switches, one for each of the two gates, one for each of the two valves and one for the buffer-beam. Once started the action of the motor in accelerating, running, retarding and stopping is automatic. Control panels are located adjacent to the motors they control and are protected, together with the motor, the limit switch and the resistance units, by large steel cabinets. These cabinets can be rolled away from the equipment they protect, thus giving easy access to any part of the apparatus.

Signal lamps are displayed on the tops of the cabinets. On the gate controller cabinet a red light shows for all positions of the gate except when it is fully open. When fully open a green signal appears, indicating that a boat may enter the lock. The signal lamps for the valves are one blue and three white lights, the blue showing that the valve is closed, and one white light appearing when it is one-third open, two when it is two-thirds open and the third when it is fully open.

A 7-hp. motor operates each gate. Through a train of gears this drives a vertical pinion, which meshes with teeth cut in the face of a spar attached at the outer end to the gate. Most of the gate machinery is in a recess below the top of the lock wall and is covered by checkered steel plates. The remainder, together with the electric equipment, is above the lock wall, protected by the controller cabinet.

On a lock having feed culverts of the 5 by 7-ft or the 6 by 8-ft. size, a 3-hp motor operates each valve. On the larger locks, those having 7 by 9-ft. culverts, 7-hp. motors are used. A part of the valve machinery is also located in a recess in the lock wall and covered with a checkered plate, while the rest is in the cabinet on the back of the wall.

At each end of each lock is placed an electric capstan, which has a capacity of 8,000 pounds at a speed of 60 feet per minute. The diameter of the spool is 12 inches. Except for the spool and the remote controller the entire capstan is set in a recess in the lock wall and is covered with checkered plates. The master switch is operated by a treadle placed flush with the plates and conveniently situated for the operator while overhauling a rope. The machinery and the 20-hp., compound-wound motor for the capstan are enclosed in a water-tight, oil-tight case. This equipment is designed to escape damage even though submerged.

Electric energy drives most of the machinery that is used at the canal terminals for handling freight, each of the larger terminals having a complete lighting and power-distributing system and also in many cases a battery-charging equipment. In general the freight-handling machinery consists of traveling cranes, derricks, conveyors, tiering machines, capstans, storage battery tractors, trailers and hand trucks.

In the chapter on canal and terminal construction we quoted from a paper read by State Engineer Williams before the State Waterways Association in 1920 on the subject of terminal development. In that paper were embodied brief descriptions of various types of terminal machinery. What we might say now concerning the electrical equipment of the terminals would be largely a repetition of those descriptions and therefore we need not say it. We may simply summarize by adding that it is electric power which is used on three of the four types of traveling cranes, the machines of chief importance at the large terminals. The fourth type is steam-driven because electric energy is not easily obtainable at all places and there must be a machine for such localities. The derricks are simpler devices, suitable for the smaller terminals, but where practicable electric power operates even these. The conveyor and tiering machine are electrically-driven. The capstans, also electrically-driven, do good work in moving boats to convenient places for loading and unloading, and the small but useful electric tractors occupy an important field.

Electricity plays an important part at the Gowanus bay grain elevator. The success of a modern elevator depends largely on the efficient loading, unloading, conveying and other handling of the grain. In such operations electric machinery is used in the Barge canal elevator wherever it is suitable.

CHAPTER XXVI

SOME NOTEWORTHY CONTRACTOR'S APPLIANCES

Comparisons with Old Machinery and Methods—Bridge Type of Conveyor—Tipple Incline—Hydraulic Disposal Boat—Tower Scraper—Aerial Conveyor—Double-Boom Conveyor—Cantilever Crane—Ladder-Dredges and Belt Conveyors—Hydraulic Dredges—Rock-Breaker—Belt Conveyor for Mixed Concrete—Floating Concrete-Mixer—Cableway Concrete-Conveyor—Tower Concrete-Distributor—Bank-Sloper—Instance of Wide Variety of Machines

IN MANY material ways the world's greatest progress has been made in recent years. This is especially true of the mechanical arts. The huge and powerful machines which today are building our public works are so familiar that we have ceased even to notice them, but we do not have to go back very far in time to find the work they are now doing being done by armies of navvies. The original channel of our own Erie canal was dug with pick and shovel, plow and scraper, and indeed the plow and scraper were considered marked improvements over the more common tools. In the report of the Canal Commissioners to the Assembly in 1818 we read, "It has been ascertained that much labor in excavation is saved, especially in dry ground, by the use of the plow and scraper;" this in comparison with "the European method with the spade and wheelbarrow."

The Commissioners continue, "And even with the spade and wheelbarrow, more progress can be made in excavation, than was supposed. As an exemplification of this remark, the commissioners state with the fullest confidence, on the authority of Messrs. Pease, Mosely and Dexter, that three Irishmen in their employ, finished, including banks and towing-path, three rods of canal, in four feet cutting, in the space of five and a half days. Thus sixteen and a half days' work accomplished the excavation of two hundred forty-nine and one-third cubic yards."

But we do not have to go back to the first building of the Erie canal to find even more primitive methods. A half century ago the Suez canal was completed. During its construction Count de Lesseps' ally, the Viceroy of Egypt, drove the wretched fellaheen by tens of thousands, under the broiling sun, to scoop the sands of the desert

with their naked hands into shallow baskets, to be carried upon their heads, under the lash of the overseer, to the spoil-bank. At night the tired bodies of these workers rested on the adjacent bank without protection. The cruelty and the consequent high mortality of these methods, however, at length attracted attention and drove Europe to rise in protest, and more modern means completed the canal.

In the present chapter we desire to notice briefly some of the machinery used in constructing the Barge canal. It is no more remarkable, of course, than that used on other large modern undertakings, but in comparison with the methods employed on earlier canals, as we have just seen, it becomes interesting. Moreover, like all enterprises of size, the Barge canal has developed some distinctive machines. Its prototype, the original New York canal, was the first large public enterprise in America. When this early waterway was begun there were virtually no engineers and no contractors in the country and machinery for such works was still to be devised. As showing the long road we have traveled between the two canals it is instructive, before we consider the modern machines, to see what beginning the early canal-builders made toward modern methods. To quote the *History of the Canal System of the State of New York*:

"In prosecuting their work through the forests the contractors were in need of an easy means of grubbing and clearing and their ingenuity was equal to the demand. Their inventions, though somewhat primitive, were a long step forward and are interesting as the precursors of modern contractors' machinery. Three of them are deserving of notice. By means of a cable attached to the top of a tree and wound on a wheel worked by an endless screw, one man was able to fell the largest trees. A machine for pulling stumps was made of an axle, twenty inches in diameter and thirty feet long, supported on wheels sixteen feet in diameter; midway on the axle was fastened a third wheel of fourteen feet diameter. When the outer wheels were braced, a chain wound about the axle and fastened to the stump, and horses or oxen attached to a rope which encircled the central wheel several times, a stump was easily pulled and then carried away by the same machine, after the outer wheels had been released. The gain in power was such that, with one machine, a team of horses and seven laborers, from thirty to forty large stumps were grubbed in a day. A plow with an additional cutting blade was invented for use among small roots."

The Barge canal has been built almost entirely by contract. Although the contracts were usually awarded to firms already having

large plants, the nature and magnitude of the canal work seemed to call in many instances for specially designed machines. Moreover, because of inaccessible locations much of the equipment had to be erected at the sites of the operations. The aggregate cost of all the machinery purchased and built for constructing the Barge canal is exceedingly large, running into the millions and probably into the tens of millions.

The largest single machine on the canal was a conveyor of bridge type, used in excavating the deep rock cut near Rochester. This was an adaptation of machines used for handling coal and ore but probably this was the first instance of its use for conveying excavated material. The depth of cut and the elevation of the spoil piles at this locality required a machine which would lift its load of broken rock from 70 to 80 feet, free and clear of all intervening machinery or obstructions, and swing it rapidly well beyond either bank. It had to be sufficiently mobile also to enable it to travel along the line of the canal. The machine built to meet this situation was of huge dimensions. The ordinary heavy, steel-truss, double-track, railway bridge of 100 feet span passed underneath its bulk without obstruction and was dwarfed by the comparison. A man standing beside even the bucket of this machine looked like a mere pigmy. The machine consisted of a bridge of cantilever type supported on two steel towers, one on each bank. Suspended from a trolley car running on the lower bridge chords were an operator's cabin and an immense grab bucket. The bridge measured 428 feet from end to end, the cantilever overhang being 128 feet beyond one tower and 96 feet beyond the other. The towers stood 90 feet high and ran upon parallel tracks. The structure weighed approximately 660 tons. The jaws of the bucket, 10 feet in width, stood 20 feet apart when fully open; its weight, empty, 21 tons; the full capacity of its bite, 12 cubic yards. For a time a large steam-shovel worked in conjunction with the bridge conveyor, loading two 12-yard skips, but it was found that by blasting the rock to smaller fragments the grab bucket could work to as good advantage. The operations of the trolley and the bucket were under the control of a single man. From his window in the trolley-cab, a hundred feet perhaps above the blasted rock, he would let the bucket swoop down like a monster bird of prey, bring it to a stop just above the surface and then let it settle gently upon the desired spot. Slowly but irresistibly the jaws would close, crunching through the rock and engorging a huge mouthful, and then the tons of broken fragments would be quickly

swung aloft and out through the tower portals to the end of the bridge, where they would be dropped on the growing rock piles. Before the last of the rock had reached the pile the bucket would be on its way back for another load, making the complete cycle of operations in from a minute and a half to two minutes.

On the upper portion of this rock cut near Rochester a simpler type of machine was used. This was known as a tippie incline. It was not used for excavating but simply for conveying the rock to the spoil piles. A steam-shovel filled the two cars that ran alternately up inclined tracks and were dumped by being tipped forward over the apex of the incline. A movable extension at the foot of the incline permitted the cars to go down into the cut within reach of the steam-shovel. The whole machine could be moved on tracks parallel with the line of the canal. This type of conveyor was not very common on the canal but several of them were in use.

The material in the bed of a certain portion of the Mohawk river gave rise to a somewhat unique contrivance. Although most of the several parts of this device had been used in other machines, the combination was peculiar and it was the first of its kind. On its side it bore the name, "Dredge No. 3, Canajoharie," but really it was no dredge at all. It became known quite generally as the hydraulic disposal boat, but this name is too indefinite to carry any idea of its nature. The conditions of its building were these: The contract was one for excavating from the bed of the Mohawk river material which, except for the presence of a rather large percentage of sizable stones and boulders, might have been handled by a hydraulic dredge. According to the specifications the contractor, if he did not remove boulders to the spoil-banks, might bury them in the bed of the river, but their tops must be at least two feet under the finished bottom plane and no compensation except for excavation to grade would be allowed. There was not sufficient space in the river to allow of dumping by scow. The only remaining course, the contractors concluded, was to segregate the boulders and send the rest of the material ashore by the hydraulic method. This plan had the advantage of permitting these large stones to be placed along the banks where the handling would be easy and also where they would serve the useful purpose of preventing scour. The disposal boat was the instrument for accomplishing the several parts of this process. In brief it screened out the boulders and placed them in scows for towing ashore, but the bulk of its work was to pump the gravel, the sand and the smaller stones through pipes to the spoil-

areas behind dikes built to hold the solid materials while allowing the water to drain back into the river.

In its entirety this excavating unit consisted of the disposal boat, two dipper-dredges, an attendant tug, scows for carrying the boulders, a small dredge with orange-peel bucket for unloading the scows, and apparatus for building the dikes. The disposal boat was the only part not of standard design.

The hull of the disposal boat was 110 feet long, 38 feet wide and 7 feet deep. The dipper-dredges operated one on each side, depositing their spoil in a hopper at the forward end of the boat. The hopper consisted of two parts, each receiving the output of a single dredge. Each part was a steel-lined table with raised sides and sloping toward a central chute. A constantly shaking motion, towards and away from the chute, was imparted to the tables, and this motion, together with four jets of water at the top of each table, gradually forced the material into the chute, the object being to retard its advance just enough to distribute the load more evenly on the pump that finally put the gravel and smaller stones ashore. The chute was also steel-lined. Here a downward slope and another jet of water moved the material into a revolving screen. This screen was 22 feet $8\frac{3}{4}$ inches long and 6 feet in diameter, mounted on four friction rollers, two of which were used to drive it. It was made of the best manganese-steel castings, built up of three sections longitudinally, each having five parts to form the circumference. The castings were about an inch and a quarter thick, reinforced by ribs and bolted together. The perforations were $7\frac{1}{2}$ inches square, with rounded corners. Between the longitudinal sections, baffle rings, three or four inches wide, projected inward. Beneath the screen was a sump, into which the material passing through the openings fell, aided by a final jet of water introduced at the upper end of the screen. This sump was directly open to the outside water, so that the pump might never suck air, even if its supply of dredged material were too long delayed. The pump itself was set at the extreme stern, connection being made with the sump through a 20-inch suction pipe. The material rejected by the screen rolled down into a skip, which was suspended from an overhead truck that ran on a track extending beyond the sides of the boat the width of the rock scows. One end of this skip could be elevated to dump its load. The skip discharged into scows on either side, according to convenience, the dipper booms of the dredges being long enough to reach the hopper with a scow between the boats. The overhang of the track could be drawn up to a vertical position when not in use.

The pump had a discharge pipe of the same size as the suction pipe — 20 inches. The pumping plant was calculated to discharge its material 28 feet above the water-level at a point 1,600 feet distant, provided no angle in the pipe exceeded 20 degrees. If no more than five feet in elevation were required, the length of the pipe could be increased to 2,400 feet.

The crew for this disposal boat consisted of an engineer and an oiler in the pump room, a fireman and a coal-passer in the boiler room, an engineer to run the 12-inch pump, an engineer in the pilot house, another engineer and one or two boys to operate the skip, and two or three deck-hands.

There was one type of combined excavator and conveyor which distinctly owed its origin to Barge canal work, having been conceived by one of the contractors' superintendents. To this was given the name, tower scraper. It was a device consisting of a simple frame tower and a hoisting engine mounted upon the same base, which operated a scraper bucket, the carrying cable running to a fastening that slid on a cable anchored at the farther side of the cut. By making the tower tall enough its range of operations could be increased to several hundred feet. At first this machine was used chiefly in diking, but later its field was extended to general excavating in shallow cuts and it was installed on many contracts. A variation on one contract was the use of two towers with cables between, standing on opposite sides of the canal cut and each operating its own bucket.

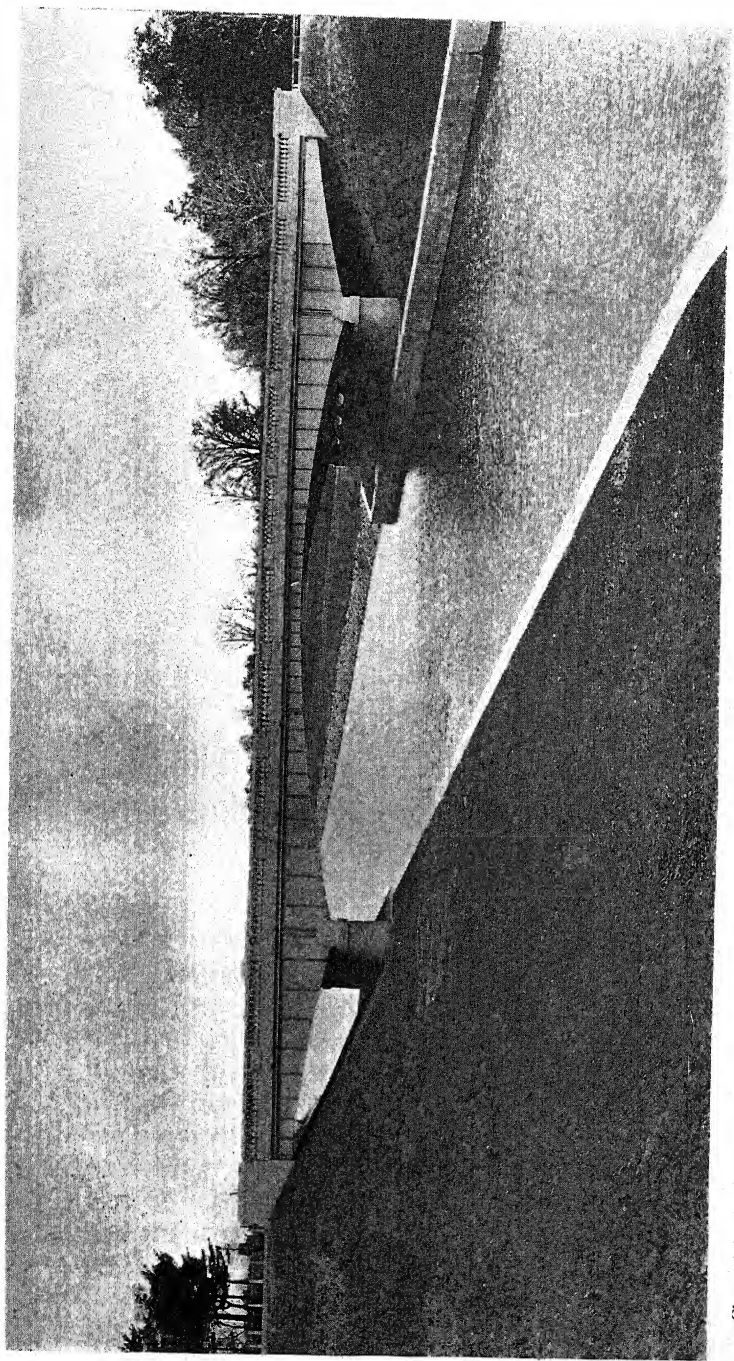
A somewhat similar device, but in this instance an adaptation of a conveyor found in a Vermont quarry, was used on one of the Champlain canal contracts. This was a conveyor simply, operating skips, the excavation being accomplished by other means. It was used in a rock cut and the blasted rock was loaded into the skips largely by hand. For the want of a better name it was called an aerial conveyor. It consisted of a high mast, set at the far edge of the spoil-area, with a series of cables running from the top of the mast to the several near-by places where the rock was being excavated. A small and rather ingeniously equipped car ran on each cable and these cars raised, lowered, carried along the cables and tripped the skips. This rather simple and inexpensive device served the need of its particular locality, where the rock cut was of small extent.

Where long stretches of canal were to be chiseled out of the rock, conveyors of a sturdier type were generally employed. An unusual member of this class was the double-boom conveyor on the section

just west of Lockport, where, perched high on the bank with its two long arms upstretched, it became a memorable sight. It was patterned after one of the most common machines on the canal, the excavator which revolved on a circular track and had a long boom that carried a bucket, generally of the drag-line, scraper type. This latter machine could scoop up a bucketful of earth and then swing around and deposit it at a considerable distance back of the prospective bank line. The double-boom conveyor was an adaptation of this scheme, but its peculiarity lay in two features. It was a conveyor solely, its booms carrying only skips, and it had two booms instead of one. It was fed by a steam-shovel, which followed in the wake of batteries of channelers and drills. The two booms were set opposite and while one skip was being loaded the other was being dumped. The contractor estimated that the time saved by having a skip in position for loading almost continuously, without stopping to attach and detach or to dump it, was of sufficient value to pay for the extra cost of a machine of this character.

Not far from the double-boom conveyor there was another interesting machine, which, however, was operating in earth and was both an excavator and a conveyor. This was a cantilever crane and it resembled somewhat the bridge conveyor, although it was of much lighter and less expensive construction. It was supported by a single, central, steel tower, which traveled on the berme bank of the canal. The excavating arm stretched across the canal to the tow-path, while the dumping arm reached back of the berme for a considerable distance, so that the spoil could be deposited well back of the bank. Operations were controlled from a stationary house at the tower, and the car, which ran on the lower chord, carried a scraper bucket. The superstructure was inclined some twelve degrees from the horizontal, dipping down toward the material to be excavated and rising above possible obstructions at the land end. This machine worked in both wet and dry material, when the water was in the canal in the summer and after it had been drawn in the winter.

Another type of machine we should notice is that called the ladder-dredge, the bucket-dredge or the elevator-dredge, all three names being applied to the same machine. But no claim for novelty can be made for this dredge or even for the combination used on the canal, that of ladder-dredge and of belt conveyor for carrying the spoil ashore. The most conspicuous of this type of dredge were the two on the contract which extended west from Oneida lake for about 42 miles. Two kinds of delivery belts were used on this con-



Channel in Genesee Valley park, Rochester, where to prevent despoiling the beauty of the landscape, structures of artistic design have been built, dikes and drains have been placed to preclude overflow and carry away seepage, and spoil-areas have been transformed into pleasing lawns.

tract. By one combination a dredge and a boat carrying a belt conveyor worked together and delivered the excavated material into scows, which were towed out into deep water in the lake, where they were dumped. By the other combination the dredge, an intermediate boat and a boat carrying a shore delivery belt were able to deposit the excavated material a hundred feet inshore at any desired height up to sixty feet above water and then to wash it still farther back some thirty feet. This machine also, with material dropping from the belt high in the air and so far from the shore line, presented an unusual sight. Another ladder-dredge, accompanied by a belt conveyor boat, was used for excavating in the channel west of Rochester. Here the new canal coincided with the old in alignment and the shore conveyor portion was of sufficient length simply to place the spoil back of the tow-path or berme banks.

From these descriptions it will be noticed how important were the devices for disposing of excavated material. In the construction of the Barge canal, as in any large enterprise of like nature, the problem of conveying excavated material to spoil-banks was often more perplexing than that of digging it and also involved greater expense. In addition to the conveying machines already described many ordinary and less spectacular methods were in daily use. The most economical way of handling much of the material was by means of hydraulic dredges and many such machines were on the canal. But these dredges were nearly all of standard type and call for no special description. One or two of the first of those to be put on the canal were peculiar in having cutters which revolved on a vertical rather than a horizontal axis, but the innovation did not prove very successful. Most of the suction dredges on the canal were of the 20-inch size. Some of them made good records; for example one had a little more than a half million yards to its credit for a month's work. In comparison with the boast of the early canal commissioners mentioned at the beginning of this chapter the amount is interesting. This dredge for a month was excavating as much material every 17 minutes as the three men together could dig in five and a half days. Or to put it another way — the dredge accomplished as much in one minute and two seconds as one of these men did in a full day.

A machine of quite different character, neither excavator nor conveyor, was the rock-breaker. This was a device for loosening subaqueous rock. In some places where there was rock to be excavated in the beds of rivers long stretches of the stream were coffer-

dammed and the work done in the dry, and in other places the material was drilled and blasted without being uncovered, in the latter case a boat carrying a battery of drills and operating engines being used, but in a few places the more unusual machine, known along the line of the canal as a rock-breaker, was employed. The principle of this method was that of loosening the rock from its bed by the impact of heavy blows. The shattering was accomplished by dropping from a considerable height a cylindrical hammer, 26 feet long and weighing between 15 and 16 tons. At the lower end of the hammer a removable section, in shape a conical point, could be renewed when worn out. The machinery was all contained within a boat that was held in position and moved by means of wire cables, anchored on shore. It was customary in operating with this device to move back and forth so as always to be working against a face of unbroken rock. After the rock-breaker had finished its work the broken fragments had to be removed by a dredge.

All of the machines thus far described have been in some way connected with the excavation of the channel. But from both an engineering and a popular point of view the structures on the canal are more interesting than the channel. When it came to furnishing machinery for building the structures, however, there was less opportunity for developing anything peculiarly striking or novel. But on one contract there was produced an appliance for conveying mixed concrete which was both striking and novel. Three locks of the Waterford series were built under this contract. These structures are all unusually large and also they are in close proximity, there being a distance of less than two thousand feet from the central lock to the farther end of either one of the other two. The economic handling of concrete in building large structures is a matter of importance of course on all occasions, but in this instance, because of the exceptional amount to be handled and the possibility of reaching all three locks without going far from a central mixing plant, the problem became one of uncommon moment. The solution in this particular case took the form of a plant in which belt conveyors did all the work of transporting materials, both before and after the concrete was mixed. Although belts had been used before for conveying materials to a mixer, this was probably the first instance of their use for carrying the mixed product to the place of deposit, at least for any considerable distance, and so the device was of especial interest.

A concrete mixer, of the Hains type, was placed about midway between two of the locks, at the center of distribution of approximately 100,000 yards of concrete work. Beside the mixer were railroad tracks of sufficient capacity to hold cars for supplying materials for 500 yards of concrete a day. The sand and stone came in bottom-dump cars, which delivered their loads through hoppers to the belts that ran to the mixer. There were bins for storing surplus sand and stone and these also were served by belts. From the cement storage house a belt ran to the mixer. All hand operations were thus reduced to a minimum. At the mixer itself a little handling was necessary; some shoveling was required in getting stone and sand from the ends of cars to the hoppers; the cement had to be carried into the house and then lifted to the belt when needed, but aside from these operations the belts did virtually all of the work.

From the mixer there extended a series of three long belt conveyors to the site of the lock, the longest being 600 feet in length. The first two conveyors discharged into hoppers, so as to feed properly to the succeeding belt and also so as to hold up the delivery of a whole or part of a batch of concrete in case of any necessity for shutting down quickly. These belts ran at a speed of about 450 feet per minute, but each succeeding one ran a little faster than its predecessor, so as to correct, especially on the long belt, any excessive loading at the mixer. The delivery at the lock was made through a huge tripper-car, which had a boom 45 feet long, carrying an independent belt. By moving this car along the length of the lock and swinging and raising or lowering the boom all parts of the work could be reached. Depending from the end of the boom swinging spouts of various lengths were used to collect all particles of the concrete to a narrow space in dropping them into the forms. This latter device, with its swaying motion, proved effective for good results, for, unlike any form of bucket which discharges a large volume quickly, with an outrush of grout incident to the operation, the belt and spout deposited the concrete gradually and secured a uniform consistency throughout the mass. Water piped to the end of the boom was at hand to be added to the mixture if necessary.

In operating the tripper-car certain hand manipulations were required, but aside from this all transportation from the mixer to the forms was done by power-driven machines. Electric current, taken from near-by lines, furnished the energy at this plant. In building the second lock under this contract the tripper-car was discarded and a belt line was run over each lock wall. Moreover, the

third lock was so far away that a train of cars was used between the mixer and a short line of belts.

Three or four other machines on the canal deserve a simple mention. At Fulton there was a floating concrete-mixing plant. At a lock near Rochester a long cableway bore the concrete in buckets from mixer to forms. During the latter part of canal construction there were several somewhat elaborate concrete-distributing plants of the high tower and long chute variety. These were not permitted during earlier construction, but canal work followed the trend of the time in this particular and conformed to what was then becoming a common practice. A rather novel contrivance was a bank-sloping machine, built for one of the Champlain contracts. Somewhat similar appliances were later used at other places.

Not all of the machinery employed in constructing the Barge canal can be said to have been eminently successful from the financial standpoint. Some of the elaborate devices cost very large sums and as they were often of novel design they received much publicity, but there is a question whether the contractor who used simpler and more usual means did not fare better in the end.

The machinery described in this chapter is not a tithe of that used throughout the whole canal. Few well-known varieties were lacking and often widely differing appliances were employed for doing the same kind of work. This fact was illustrated most vividly on the section just west of Lockport, where a greater variety of machines was found than on any other single contract. In walking over the line the first to catch our eye would have been the usual locomotive and train outfit. Then a set of guyed derricks swung their long booms from prism to spoil. Next, locomotive cranes, working in pairs, performed the same office. Again, an inclined track, with tippie at top and mounted on a traveling base, carried its cars from canal to bank. Also there was a cableway, with traveling towers adjustable as to distance between them. Still another form was the double-boom conveyor, which could be loading and discharging at the same time. These machines were all conveyors simply and each had its complement of drills and channelers and of steam-shovel, revolving drag-line excavator or other loading or digging apparatus. In addition there was also operating on the Lockport section the great cantilever crane, extending from the tow-path to the spoil-bank behind the berme. But variety of machinery is not the theme of this chapter. Rather the purpose was to describe noteworthy specimens and the most conspicuous of these have now been mentioned.

CHAPTER XXVII

STATE WATERWAYS ASSOCIATION

*Need for Body of Canal Supporters—Organizations during Agitation—
Formation of State Association—Its Place in Canal History—Its
Members Men with Altruistic Ideals—A Tribute to Them*

WE HAVE said that after the authorizing act of 1903 the canal passed from the hands of the advocates to those of the engineers. Perhaps this would seem to imply that the project had no more need of such support as its well-wishers had been giving. But this was not the case. The Barge canal has been a growth, a product of development, an evolution, and as the various accretions have come, the waterway has assuredly needed a strongly-organized body of friends—to create public sentiment, to secure the passage of new legislation, and to guard and forward its interests in many other ways. Doubtless the association which was formed for doing this work has not met these needs to the full nor even attained to the goal of its high aims, but it has done much, for one thing it has held the banner around which on emergent occasions canal forces might rally, and for what it has done it deserves praise.

During the period of Barge canal agitation there had arisen a rather numerous company of supporters and these were drawn largely from among existing commercial, industrial and civic bodies. At the forefront stood the men who had been members of the canal organization that had existed under several names and with a few interruptions since 1885. For pressing the claims of the Barge canal during the stage of its agitation these various elements had become somewhat closely associated, but when construction work began this organization, never united on a permanent basis, fell apart. Possibly these men themselves, although as individuals most of them remained active, deemed their mission as an organization accomplished. However that may be it was 1909 before formal association was effected.

At the time of beginning the Barge canal and also during the years that have followed, there has been abroad in the land, as we have seen, a well-pronounced and wide-spread movement for waterway improvements. New York was leading the states in actual accomplishment and it naturally followed that she should have a waterways association. Other such organizations had been founded in

those years; there was the National Rivers and Harbors Congress, country-wide in its interests and its membership, and the Atlantic Deeper Waterways Association, which embraced all the Atlantic seaboard states, so why not an organization in the state that was doing most in waterway construction?

Delegates from New York state at the fifth annual meeting of the National Rivers and Harbors Congress at Washington on December 9, 1908, formed a temporary organization and authorized a committee to formulate plans for a New York State Waterways Association. This committee had a meeting in Albany on the 13th of January following and another in New York city a week later. At the same time as the latter meeting there was held a conference under the auspices of the Manufacturers and Business Men's Association of Brooklyn, which was well attended by delegates from various parts of the state and at which numerous carefully-prepared papers on a wide variety of waterway topics were read. It was at this conference that the permanent organization was effected. Its president for the first year was Robert J. MacFarland of Brooklyn, and for the second year, Patrick W. Cullinan of Oswego. Then Henry W. Hill of Buffalo was chosen president and he has been reelected each succeeding year to the present time.

It is not our purpose to discourse at length upon the New York State Waterways Association, but this organization has had an important place in Barge canal history and still has a place of influence in canal economy, and to understand that history we must be cognizant of the existence of this association and also appreciative of its work. It came into being just in time to lend its aid to the projects of the Cayuga and Seneca improvement and the canal terminals. It has helped to secure whatever other additions have been made to the canal scheme, such as funds to complete the waterway after the original money was exhausted, Hudson river terminals, grain elevators, a canal traffic bureau, a law to secure harmonious relationships between railroads and canals, appropriations for additional canal surveys, investigations to further the schemes for Federal waterway construction in the state, and the improvement of the Harlem river and the Bronx kills. The Association has also backed many projects, both State and Federal, that as yet have not been undertaken, such as a Deeper Hudson, the construction of the Long Island south coast canals, the Black River extension and the Flushing-Jamaica canal, the reconstruction of the Chemung canal, the enlargement of the Glens Falls feeder and the construction of an

international canal from Montreal to Lake Champlain. It urged Government use of the canal in the time of war emergency and when that control proved detrimental it was loud in its demand for a return of the canal to the State. It has tried to stimulate greater use of the canal since its completion and just now it is panoplied for the battle against United States participation in constructing the St. Lawrence ship canal.

Although the annual gatherings of this Association are not attended by numerous delegates and while much that is said at these meetings may not be followed by effective action, the body really has a rather large constituency, including most of the commercial and industrial organizations of the state with their large memberships, and on occasion it can wield considerable power. Its latent possibility of influence, moreover, has been one of its chief virtues. It has sometimes happened that there has been urgent need for quick action in supporting or opposing State and Federal legislative enactment or in other emergent crisis and then the organization has been at hand, ready to respond to the call. That the members of the Association are generally men who have no personal interests at stake in the measures they recommend has added greatly to their influence. Sometimes it has happened that public officials on whom has rested the responsibility of approving or rejecting certain projects have looked to this organization for an unprejudiced opinion on the merits of these propositions.

We would speak not alone of this waterways association but also of the men who make up its membership. Although comparatively few in numbers, some of them have been the faithful few who could be counted on always to uphold to the utmost of their time and ability anything which promised for the public good in the way of waterway improvement. With no chance for personal gain, without even the incentive of much honor, their disinterested espousal of the canals has been an inspiration. Waterways to some of these men have become a passion; they might almost be said to be an obsession, but that word poorly describes their state of mind; moreover it is banal. But whatever the controlling motive it surely is altruistic and the result has been that the State has benefited by their unselfish zeal.

It seems fitting to quote here what appears to be an almost unconscious tribute to these men by one who is known as the Nestor of canal advocates, one who for about forty-five years has been at the forefront of canal agitation, George Clinton, grandson of

DeWitt Clinton. Mr. Clinton spoke these words when he was called upon to address the State Waterways Association a few years ago.

"Your praise gratifies me," said he, "but always brings tears to my eyes when I think of the noble men who have gone to the shadow of death, who worked shoulder to shoulder thirty years ago with those of us who began the agitation. Well, gentlemen, we have done our work. Some of us are growing old. The young men in the community must be induced to take an active interest in these matters, to study them and to devote their time, such as they can spare, to the public interest without hope of either reward from the public treasury or honors in office."

CHAPTER XXVIII

ADVERTISING THE CANAL

Publication of Barge Canal Bulletin—Akin to Canal Record and Reclamation Record—Barge Canal, Like Panama Canal, in Need of Creating Favorable Public Opinion—Services of the Bulletin: Spreading Information to the General Public: Keeping Contractors in Touch with Construction· Preventing the Repetition of Experience Like the Nine-Million Scandal: Encouraging a Spirit of Loyalty—Lectures Used—Exhibits a Valuable Means of Publicity—Various Expositions—Nature of Canal Exhibits—Highest Award at Panama-Pacific Exposition—Newspaper and Magazine Publicity—Need of More Advertising

THE MODERN business man believes in advertising. If he did not, the success of his competitors would soon convince him of his error. The State is sometimes charged with not conducting its affairs according to business methods, but, be that as it may in the main, it is true that in connection with Barge canal construction the modern business practice of advertising was employed. At least such an attempt was made, but whether the means used went far enough to accomplish all that was desired is doubtful, especially in the light of certain recent happenings.

Several channels of publicity were employed. Probably the most effectual was the issuing of a monthly publication by the State Engineer. This was called the *Barge Canal Bulletin* and its publication ran for just eleven years, beginning with the February, 1908, number and ending with that of January, 1919. The State Engineer was not alone in using this means for reaching the public ear in matters of public concern. At various times, often for terms of several years and sometimes for only short periods or even intermittently, many State departments have had their regular or occasional publications. Federal departments have done the same. Aside from the right of the people to know how their affairs are being administered, heads of departments find that it pays in both financial and moral support to keep the public informed. The publications most nearly akin to the *Barge Canal Bulletin* were the *Canal Record* and the *Reclamation Record*, the former the official Panama canal publication, the latter the monthly periodical of the United States Reclamation Service. The *Reclamation Record* did not begin publication until about two years after the first *Barge Canal Bulletin*

appeared, but the *Canal Record* antedated the *Bulletin* by five months, its first issue being that of September 4, 1907.

The *Canal Record* was a weekly publication and it differed somewhat in character from the *Barge Canal Bulletin*, serving to keep the Panama canal builders in touch with general activities on the Isthmus as well as those of construction, but this was the publication which inspired the State Engineer to issue something of a like nature. It was at the suggestion of a Federal engineer who had been engaged on early Barge canal construction that State Engineer Skene founded the monthly which his successors continued until the canal was completed in all save a few minor and incidental details.

In the history of the Panama canal there came a time when the people of the country were beginning to be dissatisfied. Things were not going smoothly on the Isthmus and changes of administration were taking place. It is said that President Roosevelt at this time determined on a plan of wide publicity, to turn the tide of popular sentiment. The *Canal Record* was one feature in this campaign; a most active press bureau, which reached to almost the last newspaper in the land, was a more effectual means. It is known by all how well this plan succeeded and much credit is due the President for conceiving the idea and boldly carrying it out, but he had a powerful ally in the nature of the enterprise itself. The Panama canal had all the elements of popularity—the romance of the Spanish conquest and of all the early days; the colossal failure of De Lesseps; the adoption of the project by the United States; its office in joining the two great oceans; its world-wide fame; its dimensions, admirably suited to tickle the American pride; the enchantment of distance from home. The Barge canal had as much or greater need for a favorable public opinion. By many and with good reason it is considered a greater engineering feat than the Panama canal, but like the prophet in his own country its home state has been foremost in failing to appreciate both its greatness and its importance. It had no such catalogue of characteristics to appeal to the imagination. In the early days of the Erie canal there had been romance in the thought of connecting the great inland seas with the ocean, but somehow that sentiment had worn threadbare. There was no glamour of the distant and the unseen. Moreover there was the very real handicap of former disfavor, a feeling which people had not forgotten or through prejudice did not want to forget. To succeed in a campaign of publicity for the Barge canal involved many difficulties the Panama builders did not have to contend with.

When the *Barge Canal Bulletin* was started there was no precedent for just the kind of publication it was thought this should be and a policy had to be worked out. Also a mailing list had to be secured and this was done by first making an initial list through a general knowledge of those persons already interested and those who should become interested in the canal and then continuing in an attempt to interest others to the point of their asking to have copies sent to them. For undertaking these tasks the State Engineer selected the writer of the present volume, since he had been in the department many years and had a rather broad acquaintance with the whole canal scheme, especially through his work as author of the former canal history, which had but recently been published under authority of State Engineer Van Alstyne. The editorship of the *Bulletin* remained the same throughout the period of its publication.

The purpose of the *Bulletin* was to give to the citizens of the state authoritative information on the whole project — what progress was being made in construction and how the money was being spent. From time to time also articles calculated to be of popular interest were published and often these were copied by the public press. In fact it was rather surprising to see to what extent the papers of the state reprinted items from the *Bulletin*, items of general interest almost without fail and often items of local interest, even the prosaic descriptions of what the contractors in the vicinity were doing.

The *Bulletin* was a boon to contractors and to those having materials or machinery to sell. It contained information on the preparation of plans, the advertising and awarding of contracts and the bids that were submitted, and so became a complete calendar for their guidance. Although the law required the advertising of a contract-letting in certain newspapers and engineering periodicals, there can be no doubt that the *Bulletin* gave material aid in securing wider competitive bidding and so helped to reduce the cost of construction. Incidentally, by keeping the contractors and indeed the whole public thus informed, the *Bulletin* saved a deal of correspondence that otherwise would have added a considerable burden to the departments of the State Engineer and the Superintendent of Public Works.

But the mission of the *Bulletin* was wider than the mere company of those who had business relations with the canal. Care was taken to send it to substantially the whole press of the state. On the mailing list were chambers of commerce and industrial organizations,

libraries and educational institutions, State and municipal officials, technical, business and social societies and a host of individuals. The edition reached a maximum of about sixty-three or sixty-four hundred. While the bulk of those receiving it lived in New York state, its circulation was by no means confined within state boundaries. Many copies went far afield, even to the ends of the earth. Probably it would have been better if more copies had gone to other parts of the country, especially to the territory surrounding the Great Lakes, and perhaps more care should have been taken to show to the people of that region how they might be benefitted by freely using the waterway after it should be completed.

There can be little doubt that one incidental good of the *Bulletin* was its service in making almost impossible a repetition of the ignominy attending the nine-million improvement. In spite of the Barge canal being the State's most stupendous project there has been scarcely a whisper of fraud or improper conduct during its whole construction. To be sure there has occurred little or nothing to give color to any charge of such character, but to one who has been connected with both canal enlargements the easy possibility of a different story is apparent. Very few persons know how the nine-million scandal started. The desire of a discharged engineer for revenge, without caring whom or what he injured, was at the bottom of the whole disgraceful affair. The investigating commission found little that was blameworthy, virtually nothing so far as the engineers were concerned, but the sinister stories, once given utterance, kept on going, and some of the engineers were ruined professionally and the canal received such a staggering blow that it has hardly yet recovered. But the point of the recital is that without knowledge of actual facts the people of the state could not discern between just criticism and calumny. If a policy had been adopted of sending broadcast reports of the improvement and its financial standing, it is quite believable that the whole unpleasant experience might have been avoided.

Another incidental benefit was the *esprit de corps* which the *Bulletin* tended to foster among the many engineers and other employees engaged in prosecuting the work. By getting a more comprehensive view of the entire project these men could labor together more harmoniously, to the advantage of the whole work and the mutual benefit of all concerned. This spirit of loyalty and pride might well have been encouraged much further. At Panama it was so encouraged and the good results were apparent.

Another instrument of publicity was the lecture. Some of the engineers had the ability to speak in public and, assisted by lantern slides or motion pictures, they interested many an audience gathered under the auspices of some organization. In making a pictorial record of progress hundreds of photographs of the work have been taken and it was easy to prepare very attractive sets of lantern slides. Some of the machinery used in building the canal was of novel character, as we have seen, and lent itself to rather unique film productions. Motion picture companies were induced to photograph canal construction and to send these views upon their circuits and incidentally to furnish a reel for State official use. Thus by way of supplying a pleasing entertainment the lecturers were able to do a valuable work in canal education, and this means of publicity also was carried beyond the state confines.

Yet another means of advertising the Barge canal was the sending of exhibits to various state, national and industrial expositions. Many thousands of people were thus enabled to learn through a pleasant diversion something about the canal. As the expositions lasted from a week or two to well towards a year, as in the case of the national shows, and as there were thousands of visitors each day, the number of those reached ran up into the hundreds of thousands. Annually for about eight or nine years the State Engineer had exhibits at the New York State Fair. Then there were numerous exhibits at various industrial expositions in New York city and elsewhere; also one at the International Navigation Congress in Philadelphia, one at an Atlantic Deeper Waterways convention in New London and another at a Middle Western meeting in Pittsburg. Besides these there was an exhibit at the Alaska-Yukon-Pacific Exposition at Seattle in 1909 and the most elaborate exhibit of all at the Panama-Pacific International Exposition at San Francisco in 1915. In all there were more than a score of these occasions, and at each place, except Seattle, from one to a half dozen representatives of the State Engineer's department were in attendance. These exhibits were not small and most of them required several months for preparation. They were made possible by money for expenses being furnished by the organizations under whose auspices they were held. On a few occasions portions of them were loaned for still other expositions or fairs.

Early in the experience of preparing these exhibits it was perceived that they had to be such as would make a strong appeal to the passer-by at his first glance, and then interesting enough to hold

his attention. Models of noteworthy structures or of portions of the canal seemed to serve this purpose and moreover an exhibit of this character could be made to furnish such information as it was desired to impart. The models were always workable and generally the working was done in part by hand, rather than being entirely mechanical, and therein probably lay the secret of their appeal, for people seem to be interested most in that which has about it the personal touch. That these exhibits attracted the people was attested by the crowds that generally stood in front of them.

A few words in relation to the Barge canal exhibit at San Francisco are pertinent here. In announcing the prize given to this exhibit the *Barge Canal Bulletin* explained that this award was not only a recognition of the exhibit but also an appreciation of both the canal itself and the place it occupies among the engineering enterprises of the world. For this reason it seems well to quote the *Bulletin*.

"It is a source of considerable satisfaction," it said, "to those who have been connected with the construction of the Barge canal that the international jury of awards at the Panama-Pacific Exposition has recently granted the grand prize, or highest award, to the Barge canal exhibit. A detailed account of this exhibit was published in the February *Bulletin*. A comparatively small amount of money was available for making the exhibit and consequently it could not be entirely comprehensive, but the jury took into consideration the Barge canal as a project as well as the exhibit itself, and thus this award becomes a distinct recognition of the canal as one of the greatest engineering feats of its time, since it receives the same award as its two chief rivals at the exposition, one being the United States Government exhibit, which occupies half of an entire building and contains models of all engineering features undertaken by the Government in recent years, and the other the Panama canal zone concession, which is a replica of the Isthmian canal, covering more than an acre, costing \$400,000 and built for financial profit, a charge of fifty cents being charged for admission. Besides these two rivals, the Barge canal had formidable competitors in the exhibits of foreign governments, other states, New York city and large corporations.

"When in a former announcement the jury had granted simply a gold medal to the Barge canal exhibit, a protest was made, both by the State Engineer and his representative at the Exposition, and by the New York State Commission. The protest was entered on

the ground that it was unfair to make this exhibit compete with those costing more than twenty-five times as much or with money-making concessions. The apportionment for the Barge canal exhibit was only \$15,000 and this sum had to cover the cost of making, transporting and installing its various parts, building its enclosing booth, furnishing considerable electric power and water for operation and supplying two and part of the time three competent men in attendance during the ten months of the Exposition, including their salaries and the salaries and traveling expenses of three men sent for the installation. The rates on models and the distances are such that the item of transportation alone was about a thousand dollars. Thus only about half of the appropriation was available for the preparation of the exhibit itself.

"In response to the protest the jury reconsidered its decision and did better even than it was asked. It did not simply put the Barge canal exhibit at the head of a class in which it was contended it might justly compete, but it gave the exhibit equal rank with the United States Government exhibit and the Panama canal zone concession.

"In making the award the problems arising in making the models were taken into account and it was decided that, although the models were fewer in number and smaller than in some other exhibits, more ingenuity was shown, as much even as would be demanded in making the original structures or machines they represent. In this reconsideration also, as has been stated, account was taken of the project which the exhibit portrays. The supreme engineering skill demanded in its design and construction was recognized, the multitude of difficulties overcome was considered and its rightful place among inland canals was acknowledged in the award of the highest honor, the grand prize."

For the past seven or eight years the State Engineer's department has had connected with it one or two men who formerly were in journalistic work and had had a thorough newspaper training. These men have used their earlier experiences for the benefit of the canal and have been able to do a large amount of valuable publicity work, sending to the daily press news items and also both signed and unsigned articles of general interest, and contributing to scientific papers writings which have interested the student or more often to the magazines such articles as have had the popular appeal

The advertising activities we have described were carried on chiefly by the State Engineer's department. Other departments

have sometimes assisted. The Superintendent of Public Works and his traffic bureau have done this, but their participation has been largely in the latter years of construction, during the period since the canal has been nearly or quite completed. Of course there has been a vast amount of publicity in which the State has had little or no direct share. Numerous canal articles have been published in popular and technical periodicals and the newspapers have been printing editorials and news items for many years. Whenever canal officials have been asked for help in preparing these articles or for photographs to illustrate them, they have gladly complied. In the recent agitation for a St. Lawrence ship canal the Barge canal has received much incidental publicity. It may be that the advertising from this source will serve better than anything that has gone before to awaken the people of New York state and make them more appreciative of their own canal.

In all of this advertising, particularly that in which the State has been engaged, there has been back of it one main purpose — to do whatever might best help to build up canal traffic after the waterway should be completed. It would seem that the shippers of the state should all have heard of the benefits of water transportation by this time. The canal, however, is not yet being used to the extent it should be. There are reasons for this, but perhaps considerable advertising must still be done in our own state. It would seem also that shippers beyond the state boundaries should by now have had some adequate conception of the Barge canal and be willing to give it a trial. But probably the radiant halo of the ship canal idea has been only dimmed, never lost in the Middle West and whatever messages concerning New York's canal have reached the people of this locality have not fallen on receptive ears.

CHAPTER XXIX

THE CANAL AND A DEEPER HUDSON

The Hudson an Integral Part of State Waterway System—Deeper Hudson Project Springs from Barge Canal—Close Relationship between Canal and Proposed Deepening—Congested Port at New York Furnishes Reason for Project—Other Inland Seaports—Arguments Advanced Favorable Terminal and Factory Sites at Head of River Navigation—Best Distributing Point on Atlantic Slope: Commerce Already Large and Likely to Increase Enormously: Improvement Needed by Interior Points Easily Accomplished: Railroad and Steamship Efforts Unavailing: Other Port Facilities Inadequate and Expensive to Increase: Water Transportation Cheapest: Improvement Feasible from Engineering and Commercial Standpoints—Saving on Rates Would Pay for Undertaking—Attitude of People of Capitol District—Present Status of Project—The Scheme One of National Significance.

THE TERMINUS of the Barge canal nearest to the ocean is still one hundred and fifty miles away. In the bed of the Hudson river at Waterford lie the eastern end of the Erie branch and the southern end of the Champlain branch. From this point of junction the Federal government has carried the canal about five miles down the Hudson to Troy. So far as work done by either State or Federal authorities on the project known as the Barge canal is concerned it ends at Troy, and this point, as just stated, is a hundred and fifty miles from New York. The condition of the channel in the Hudson south from Troy, therefore, is all-important to the New York canals. As a matter of fact this portion of the Hudson is really an integral part of the State waterway system, but until recently it has not been customary so to regard it, and moreover even yet the Barge canal is considered as ending at Troy. Whatever improvements have been made below Troy are looked upon as separate schemes.

Tidal navigation extends all the way up the Hudson to Troy. As far north as the city of Hudson the river has a depth of at least twenty-three feet, but above that point it becomes much shallower and as a result artificial improvements have been necessary. Until 1891 the State made whatever improvements were attempted. Then the United States assumed control. The work it has done to improve navigation has been considerable in extent and among its undertakings has been a channel equal in depth to that of the Barge canal.

Growing out of Barge canal construction, however, there sprang up an agitation for a much deeper channel in the Hudson, deep enough in fact to accommodate ocean vessels. The sponsors for the movement were the cities near the head of navigation, Albany and Troy chiefly. At first these two cities were working at cross-purposes; Albany wanted the deep channel to stop at its own waterfront, lest it should not reap the full benefit of being the transfer point, while Troy was not satisfied with anything less than a full depth channel to the dam which stood both at the head of tidal navigation and at the southerly end of the Barge canal. Later these divergent aims were pooled, and out of this common desire there has grown a community of interests which include many other public objectives as well and affect a widened circle of territory, one embracing Albany, Troy, Schenectady, Cohoes, Waterford, Watervliet, Green Island and Rensselaer, and come to be known as the Capitol District.

This project for a "Deeper Hudson," as it is called, has gained wide publicity and also a backing of considerable strength. It is an enterprise which falls under Federal jurisdiction and as yet has not reached the stage of authorization. But although the scheme was launched early in the period of Barge canal construction the interested cities have still retained their zeal and year after year their delegates have attended the conventions of the State Waterways Association, the Atlantic Deeper Waterways Association and the National Rivers and Harbors Congress, and these bodies have as regularly given the project their recognition and endorsement.

Albany and Troy took the lead in championing a river channel deepened for ocean vessels, but early in their campaign they gained added strength through enlisting other Hudson river cities in the enterprise. There resulted an organization known as the Hudson River Improvement Association, which advocated a 22-foot channel in the Hudson as far north as the end of the Barge canal. Subsequently the depth of channel sought was increased to 27 feet.

It readily appears that the relationship between the Barge canal and a Deeper Hudson is very intimate. Since together they would constitute an important connecting link between the Great Lakes system of waterways on the one hand and the ocean and the chain of intracoastal canals on the other, the project assumes a national or even an international aspect. The State and its various officials have given the enterprise their approval. If ocean vessels could meet canal craft at Albany or Troy, the whole scheme of canal

traffic would be greatly altered. In any study of the Barge canal, therefore, it becomes necessary to know the essential facts in regard to the proposed deepening of the Hudson and also the reasons which have been put forth in support of demands made upon the Federal government for performing the work.

It cannot be gainsaid of course that the promoters of this scheme were influenced primarily by a desire to advance the welfare of their own communities, but the insufficient terminal facilities and the resulting congestion in all commerce at New York city formed the foundation on which to build this framework of an inland seaport. Conditions in New York were already serious and the outlook at that time did not hold any hope for adequate future improvement. Students of transportation declared that with the opening of the Panama canal New York was in position to become the supreme seaport of the world, the meeting place of commerce from the East and the West, from the cities of North and South America, from the Orient and Europe, the great point of transshipment in the Occidental and Oriental trade. With these conditions and this prospect in view the advocates of a seaport at the head of tidal navigation laid their plans and advanced their arguments.

Such an inland seaport was not without precedent. Europe furnished several examples. There was Manchester, which was reached through a ship canal thirty-five miles long, on which there were five sets of locks. Its commerce had grown from nothing to large proportions. Hamburg was about eighty-five miles from the sea. The improvement of the Elbe river made it a seaport and ships from all the ports of the world were reaching its docks. Amsterdam, at one time the greatest port in the world, was an inland port about seventeen miles from the ocean and was reached by a canal which had a lock at the sea entrance.

In order that a locality may become an important port it must have at least the following three qualifications: Its topography must be such as to permit the development of large docks, terminals and transshipping yards; it must have good distributing facilities by either rail or water or both; it must have a rich hinterland with either a commerce already developed or one that can be developed by the proposed improvement. The Capitol District, so the promoters held, possessed all of these advantages.

In substantiation of these and other claims the sponsors have conducted a campaign of education, publishing literature from time to time. A few transcripts or summaries from these pamphlets will

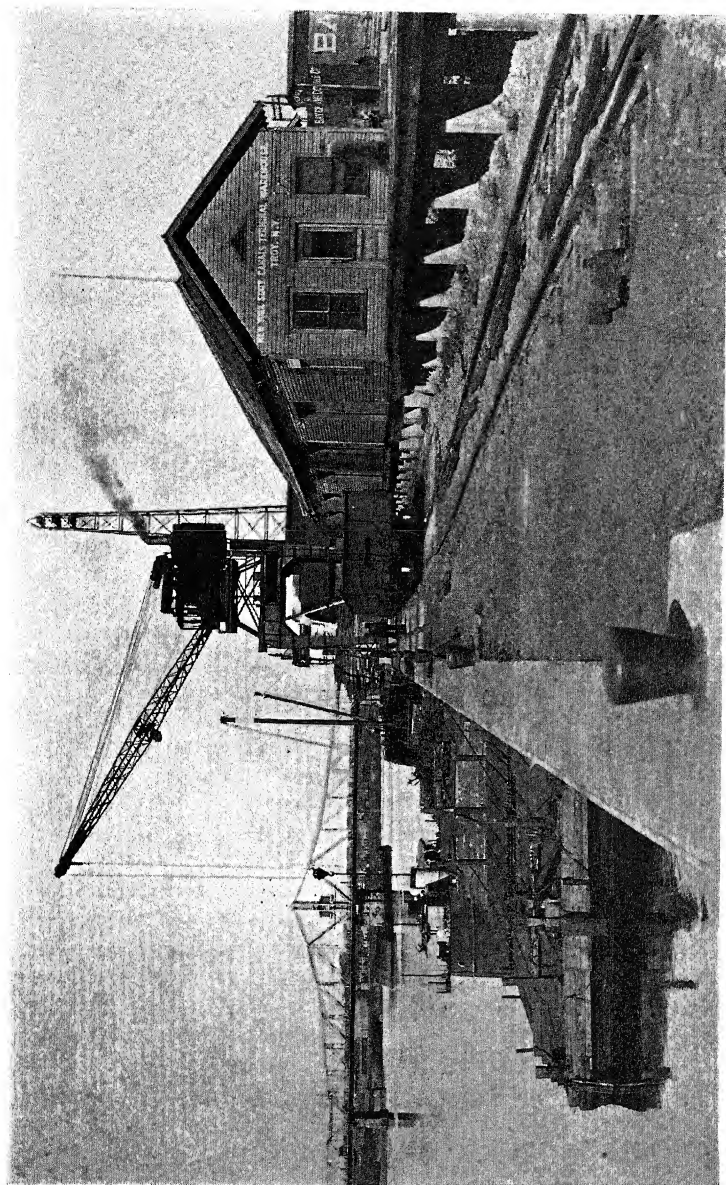
best contribute to a comprehensive understanding of the whole project and will also reveal the arguments in its behalf. The following discussion is such a summary.

In the Capitol District there are at least ten square miles of cheap, flat, bottom lands lying adjacent to railroad terminals and well situated for docks and factory sites. Terminal charges would be much lower here than in New York, where land values are excessively high.

This district is unusually well provided with shipping facilities, being a railway and canal center. Here meet important lines from the west, east, north and south. The Boston and Albany, the Boston and Maine and the Delaware and Hudson railroads reach into New England and Canada, the New York Central four-track road and the West Shore double-track line connect with the Great Lakes and the Middle West, also with New York city; the Delaware and Hudson extends into the coal fields of Pennsylvania; the district has more freight and passenger trains daily than Buffalo, showing its importance as a railroad center. Here meet the eastern terminus of the Erie canal and the southern terminus of the Champlain canal. No other point on the Atlantic slope is so favorably situated as a distributing center for commerce destined for the Great Lakes and the north central states by either rail or water.

The commerce of this locality is already important both in tonnage and value, the amount available for river transportation exceeding the accommodations offered and being diverted in part to other channels. The commerce in the river would be enormously increased by the Barge canal. Northern New York is already a very important manufacturing district and this territory is yet far from being developed. The Capitol District is capable of large development. Contemplated water-power installations would furnish ten times the amount of power already used, making possible the building up of a vast manufacturing center. It possesses unusual advantages for becoming a large lumber-distributing mart. With sea-going vessels reaching its ports this district would become the natural outlet for all Canadian trade with South American and Pacific ocean points and might attract much other Canadian commerce.

To allow the country at large and especially the region between the Mississippi river and the Atlantic seaboard to reap the benefit of the Panama canal, sea-going vessels should penetrate to the terminus of the Barge canal.



Terminal at Troy, the point of transfer with New England. A full portal steam crane is shown. This is equipped with a lifting magnet. At the dockwall lies a barge carrying steel rails, which are being transferred by means of the magnet. There are rail connections at this terminal with the Boston and Maine and the New York Central railroads.

The Hudson is a natural arm of the sea, navigable for 120 miles of its length to most ocean-going vessels. In this portion it has a width of at least 600 feet and generally is much wider. The improvement of the remaining thirty miles would involve for the most part soft excavation at a light cost. The stream is tidal and requires no lock and there would be no question of adequate water supply.

Railroad and steamship companies had done their utmost to hasten shipments from producer to consumer, having built great terminals and increasing enormously the rate of speed, only to have their efforts largely made void by the delays due to congestion.

The port facilities along the Hudson and especially at New York city were inadequate and the cost of providing suitable facilities at New York was so high as to be almost prohibitive. The cost of a single pier there would build a whole system of terminals in the Capitol District. Even if these facilities were provided, the question of rail transportation to interior points was still unsolved.

As haulage by rail costs ten times as much as by water, a seaport 150 miles inland would effect a considerable saving, since the distance by rail to interior points would be materially lessened.

The project of deepening the Hudson to 27 feet was entirely feasible and presented no difficult engineering features. The cost of maintenance and operation would be exceptionally low for a scheme of that nature. No unusual hazards to sea-going ships would be found in navigating this river and it was possible to make a channel of greater width than common for canalized rivers. A large part of the freight originating at points along the Great Lakes could be brought to the Hudson by water without breaking bulk. Large shippers and ship-builders were already working on designs of steel vessels that could use the Barge canal and yet be seaworthy on the Lakes. Freight handled thus could be brought to the Hudson for about one-tenth of what the railroads would charge. After reaching the Hudson the goods destined for export could be handled more cheaply on vessels of deeper draft.

The saving in freight charges on freight destined to interior points would be large and as the amount of freight affected by this saving was immense the resulting benefit to the country would be enough to pay many times the total cost of the undertaking.

Such are the arguments which have been advanced by the friends of a Deeper Hudson. The press of the Capitol District has been most persistent in its advocacy of the project, never letting an oppor-

tunity escape for upholding the cause in strong editorial or pertinent comment. As a result the people of the region are arrayed in almost solid ranks for its support.

It will be noticed that some of the arguments advanced by the Deeper Hudson advocates do not accord with the principle underlying the Barge canal theory, namely, that a transfer of freight from lake to canal boat, each designed especially for its own particular channel, is more sound economically than a shipment without transfer on a boat which tries to navigate successfully both types of channel

The Federal government seems to have taken the stand which its engineers assumed several years ago in reporting on this project, namely, that although this river is a very important waterway and at some time it will be advisable to deepen it to at least 27 feet, for the present nothing should be done.

The citizens of New York state have long felt that their treatment at the hands of Congress in the matter of appropriations for river and harbor improvements is far from just, that more than five or six per cent of the total of such appropriations is deserved for supplying the facilities to handle one-half of all the foreign commerce of the country. The exports and imports which pass through New York are not simply of local concern; they affect the whole nation. So too the Deeper Hudson is a scheme of national significance. In spite of long delay its advocates are still hopeful that eventually their desires will be realized.

CHAPTER XXX

THE CANAL AND THE PORT OF NEW YORK

Port of New York Preeminent in World—Changes Taking Place—Port and Canal Interdependent—Canal Participation at Inception of Port Improvement—Canal Construction at the Port—Coöperation between New York and New Jersey an Outgrowth of Harbor Case—Creation and Work of Bi-State Commission—Port Authority Created—Treaty between States Ratified by President—Work of Port Authority—Principles Governing Solution of Port Problem—Outline of Plans—Need of Haste in Undertaking Work.

THE STATE canals have played no small part in making the port of New York what it is today—without a rival in America, outranking all ports of the world in volume and value of its commerce. So long has this been the greatest port of the country that it is hard to realize that it did not always enjoy this exalted station. But before the original waterways were built New York ranked in second or third place and there can be little doubt that the canal was the chief factor in effecting the change. Indeed it is commonly conceded that the two predominant causes in making this the greatest port on the continent were, first, the topography of the port itself, and second, the canal. Nature's gift was the safe harbor with its 800 miles of shore line, where piers, docks, warehouses and other shipping facilities might be built and where industrial sites might be found. Man's contribution was the canal. Later came the railroads and this trio of propitious causes placed the port far in the lead and moreover they have kept it there ever since and also have made the city the mighty metropolis of the western hemisphere.

In the early days of its existence and even until 1870, according to an eminent authority,* the Erie canal possessed such a large influence over the port of New York that its success depended primarily upon this waterway. But as the railroads came and grew and as there entered and multiplied other factors in determining this control, the canal dominance dwindled to but a fraction of its former strength. Now, however, the canal has been transformed into an

* Professor Emory R. Johnson in testimony in the New York Harbor Case.

efficient modern avenue of transportation and following in point of time this canal rejuvenation there is taking place a like transformation in the port itself. It cannot be said that it is the influence of the canal alone which is bringing about this change in the port, the present canal influence is by no means powerful enough for that, but these improvements in both canal and port are very closely allied and moreover it is doubtless true that they are due in large measure to common causes. The revival of interest in waterways has been world-wide. For a long time it has been known that in America our transportation systems have been inadequate and year by year have become less and less able to meet our needs. Facilities for commerce in our metropolis have been admittedly so poor that trade of necessity has had to seek rival ports. All this could lead to but one result, a congestion ending often in stagnation. Such are the common causes which have wrought the changes in canal and port — a revival of public interest and a situation so acute as finally for self-preservation to compel improvements. But there has been a recent and peculiar manifestation of the causes underlying the improvements in canal and port, and this has affected the State in part but the city more especially. The inadequacy of facilities and the increasing acuteness of congestion at its chief port have long been borne by the business interests of the country with such patience as could be mustered, but finally a storm of protest, after years of threatening rumblings, has burst in full fury. New York city at last has begun to realize its peril. As United States Shipping Commissioner Love recently said, in speaking before the Port Authority, New York has lost the cotton trade and also the tobacco trade and is fast losing the grain trade. As another recent speaker * has put it, the country is demanding drastic remedies so that it may be freed from the tremendous burdens that have been placed upon its commerce because it has permitted the continuance of conditions which have forced the foreign business of the country largely through, what he terms, the archaic port of New York. A score of years ago the State of New York saw on the horizon the signs of this coming storm and as its contribution to a solution of the problem has constructed a modern canal with numerous well-equipped terminals and a capacious as well as extremely necessary grain elevator in the port of New York. Some five years ago the city of New York made its first effective move toward adequate port

* Congressman A. P. Nelson, in a speech made in the House of Representatives on December 5, 1921.

improvements. But it is since that time that the storm has burst. We cannot help wondering whether the city, feeling secure in its possession of half of the nation's export and import trade, has waited too long in bestirring itself. But however that may be, it was to relieve the paralyzing congestion and retain its trade that the world's greatest port planned its improvements and now, spurred to greater efforts by threat of misfortune, is endeavoring to carry its plans into execution. The port of New York has heard the cry of the West for other outlets and this has become a large contributing and impelling incentive for activity.

In addition to a oneness in causes the Barge canal and the port of New York have much else in common. The relationship between them is very close. The success of the port is not entirely dependent upon the existence of the canal, although the canal does have an influence and a rather large influence, both because it can contribute a considerable volume of commerce and because it acts as a potent regulator of rates. But on the other hand the success of the canal is largely dependent upon the efficiency of the port. If delays and high costs in delivering or transshipping freight at the port nullify the advantages of water transportation or turn traffic to other channels, the canal suffers.

The Barge canal moreover had a peculiarly intimate connection with the port improvement scheme at the inception of its present effective stage. The development of the port of New York has been a work of many years and its history of course contains numerous incidents, but the present phase, the adoption of a policy which at last seems to hold promise of being fundamentally sound and sufficiently broad to work out the salvation of the port, is of but a few years standing. This phase may be said to have had its beginning in what is known as the New York Harbor Case, a case heard before the Interstate Commerce Commission in January, 1917, in which the States of New York and New Jersey were pitted against each other. In this case the influence of the canal on the port—how New York State had contributed toward building up the port by constructing, improving and maintaining its canals for a hundred years and what the State was then doing in the huge modern canal improvement—held a prominent place in the evidence presented. Also State Engineer Williams was an important and valuable witness. Furthermore, one of the lines of evidence on the New York side attempted to show from a study of the statistics of population and of commercial and industrial growth that New York was almost entirely responsible for the development of the

whole port, the New Jersey portion included. This study was suggested to New York's chief counsel by the chapter in the *History of the New York State Canals* on the "Influence of the Canal" and the State Engineer was asked to furnish the men to make the study. The author of the present volume, because of his connection with the former history, was one of the two men assigned to this task.

The success of the Barge canal, as we have said, goes hand in hand with that of the port of New York, and because there is this mutual relationship between the two it is essential to a complete understanding of the canal problem that we know past and present conditions in the port and also the plans for the future.

Even in the canal project itself there was included a comparatively large New York port improvement. Nearly half of the original appropriation for canal terminals was spent on the terminals in New York city and this sum was materially augmented by an amount for a large grain elevator at one of these terminals, a structure vitally necessary for New York's retention of its grain trade and the only elevator not dominated by strict railroad control. Before the Barge canal was constructed New York city's perfunctory and almost useless provision for canal traffic had become a jest and a by-word, but now the well-equipped and commodious terminals not only furnish canal accommodations but have added considerably to the efficiency of the whole port.

The New York Harbor Case has been called by one intimately connected with it a blessing in disguise. It was instituted by New Jersey on the plea that in justice she should have the benefit or the actual lesser rates to the railroad terminals within her borders rather than be charged the same rates as those for Manhattan and Brooklyn, which included lighterage costs in addition to rail charges. In its potentialities for undermining well nigh the whole commercial and industrial foundation on which New York city's greatness rested the case was one of the most important which the metropolis had ever been called upon to contest, and a reading of the current editorials of the city press reveals that the thinking men of the city so regarded it. But we need not now concern ourselves either with the details of the case or the history of port disputes which preceded it. In its decision the Interstate Commerce Commission declined to disturb the existing rate situation, but it counseled cooperation, and coöperation is just what has come out of the case and has made it a blessing in disguise. For years the inadequacy of the port had been apparent, but because the harbor was divided between two states, petty rivalry and jealousy and a short-sighted unwillingness to regard

the whole port as the single unit which by nature it was, had crowded out mutually helpful relationships.

The case was a blessing also in being the cause incidentally of a wide educational movement. While it was pending there resulted a large discussion of the problem of port organization. All the trades and civic bodies within the metropolitan district became vitally interested and the cities and commercial organizations along the Hudson were much concerned. The press of both New York and New Jersey gave the problems so much publicity that when the officials of the two States joined interests the people were ready to acquiesce and unite for the common good.

It may be that no adequate solution of the port problem could have been reached sooner. Doubtless it required an awakened New Jersey, a New York city with its transit question well past the initial stage, a New York State with its canal nearing completion, and an aroused spirit of liberality, which would break down political barriers and put aside jealousies, before the people of the metropolitan district were willing to make common sacrifice as well as common cause for a common future and could unite whole-heartedly in grappling with a common problem.

The united action was under the guidance of a bi-state commission, known as the New York, New Jersey Port and Harbor Development Commission, which consisted of three men from New York and three from New Jersey. The best expert talent in the land was employed and an exhaustive study was made of terminal conditions and operations in all its phases throughout the whole metropolitan district, now recognized as the Port of New York. Incidentally it is of some local interest to know that Barge canal engineers were loaned by State Engineer Williams to make the surveys of the proposed outer belt line railway to connect all the railroads entering New York city from the west.

Following this first commission there has been created a new body, given the rather clumsy title, Port of New York Authority, likewise composed of three men from New York and three from New Jersey. One of the New York members is Alfred E. Smith, former Governor of New York. Mr. Smith has recently contributed to a current periodical an article dealing with the port problem and what is being done to solve it, and so lucid and concise is his account that we shall let him tell the remainder of the story.

"After thorough investigation," says Mr. Smith, "the Bi-State Commission made final report to the Legislature of 1921, which recommended the creation of a port district to be defined by law and

to include one hundred and five organized municipalities, embracing a population of about 8,000,000 people. At present it is served by twelve trunk-line railways, which bring to or take out of or through the port over 75,000,000 tons of freight per annum. An immense number of foreign and domestic steamships, not less than 8,000, equally bring to or take out of the port over 45,000,000 additional tons of freight per annum. Within the port district there is more manufacturing output than in any similar area in the world, with a variety of products and commodities to be handled unparalleled anywhere else. Four million tons of foodstuffs alone are annually required by the people of the port district.

"The Bi-State Commission recommended a treaty between the two States calling for comprehensive development of the port which would effectuate a compact binding them, and establishing a port district and a Port of New York Authority over it. The Port Authority is composed of three members from New York and three members from New Jersey, and is a body corporate and politic. It is charged with the supervision and carrying out of comprehensive plans after they have received the approval of the Legislatures of both States.

"On August 23, 1921, President Harding approved the action of Congress ratifying the treaty and affixed his signature. There were appropriate ceremonies to mark so important an occasion.

"The Port Authority was directed by statute to study the plan of the Bi-State Commission, and any other plan that might be placed before it for consideration. This it did, working night and day during the summer and fall of 1921, and on January 1 of this year submitted to the Legislatures of both States a comprehensive plan.

"As an approach to the great task of preparing the plan, provision was made for the formation of an Advisory Council made up of representatives of chambers of commerce, boards of trade, and civic societies, of which there are one hundred and three within the port district. The several agencies engaged in transportation, such as the twelve trunk-line railways, the steamship companies, lighterage companies, warehouses and trucking interests, and various specialized industries, were all invited to organize co-operating committees in order that points of contact might be immediately established for the necessary conferences.

"Inasmuch as this whole problem is one that not only affects the business interests as far as the cost of business at the port is concerned, but also vitally affects the household and the cost of living, an Educational Council was organized to inform the public on the

subject and to lend its active assistance. In this Council individuals as well as representatives of all organizations within the port found membership.

"After long hours of conference with steamship companies, railway engineers, and terminal operators, all the facts set forth as to cost and method in the Bi-State Commission were substantially admitted and certain fundamental conditions were laid down as tending to provide a proper solution of the problem and to guide the Commission in setting forth the physical plans, and, so far as can be shown to be economically practical, the following definite fundamental principles were adopted:

"That terminal operations within the port district, so far as practicable, should be unified;

"That there should be consolidation of shipments at proper classification points, so as to eliminate duplication of effort, inefficient loading of equipment, and reduction in expenses;

"That there should be the most direct routing of all commodities, so as to avoid centers of congestion, conflicting currents, and long truck hauls;

"That terminal stations established under the comprehensive plan should be union stations, so far as practicable;

"That the process of co-ordinating facilities should so far as practicable adapt existing facilities as integral parts of the new system, so as to avoid needless destruction of existing capital investment and reduce so far as possible the requirements for new capital; and endeavor should be made to obtain the consent of the States and local municipalities within the port district for the co-ordination of their present and contemplated port and terminal facilities with the whole plan;

"That freight from all railroads must be brought to all parts of the port wherever practicable without cars breaking bulk, and this necessitates tunnel connection between New Jersey and Long Island, and tunnel or bridge connections between other parts of the port;

"That there should be urged upon the Federal authorities improvement of channels so as to give access for that type of water-borne commerce adapted to the various forms of development which the respective shore-fronts and adjacent lands of the port would best lend themselves to;

"Highways for motor-truck traffic should be laid out so as to permit the most efficient inter-relation between terminals, piers, and industrial establishments not equipped with railroad

sidings, and for the distribution of building materials and many other commodities which must be handled by trucks; these highways to connect with existing or projected bridges, tunnels, and ferries;

"Definite methods for prompt relief must be devised that can be applied for the better co-ordination and operation of existing facilities while larger and more comprehensive plans for future development are being carried out. . . .

"The inauguration of the Port Plan does not mean that the entire new plan is to be effective at once. It does mean that it will be undertaken and extended as the needs of industry require. . . .

"To correct some false impressions, let me therefore say that under no conditions can the property of any municipality be touched for the improvement without its consent. Further, no public money is required to finance the project. The Port Authority is a body corporate and politic and must by the sale of bonds raise the necessary money to carry out its projects, and necessarily these must be self-sustaining in order that the interest and amortization payments on the bonds can be met from the profits of operation.

"The plan, among other things, recognizes the fundamental business principle that as much as possible of existing property and equipment already built and in operation should be used. Accordingly the plan takes full advantage of the great classification and break-up yards already built and in operation on the New Jersey side. The next step is to connect them with the New York side of the port. That is proposed to be done by a tunnel under the bay from the so-called Greenville Yards in New Jersey to a point in South Brooklyn where direct rail connection can be made with the New York Connecting Railroad, already built through Brooklyn, for transfer to the New England lines, with proper spurs along the water-front and to Jamaica Bay to meet the needs of that section. It also provides for proper spurs from the New York Connecting Railway to the Brooklyn water-front and into the Bronx, so that sections of the Bronx not adapted to residential purposes may be hereafter developed for industrial uses, enjoying the benefits of direct rail connection with the twelve great trunk lines of the country entering the Port of New York.

"The island of Manhattan presents the most difficult part of the problem.

"The Borough of Richmond is taken care of by the extension of the inner belt line in New Jersey down and across the Arthur Kill

by enlarging the existing bridge and widening the tracks of the Baltimore and Ohio Railroad.

"Aside from its physical aspect, the plan has for its purpose the unification of present terminal facilities. During the war, when the management of the railways was in the hands of the Government and they were used as an agency to win the war, they were compelled by Executive edict to unify their existing terminal facilities in the interest of speed and economy. Had it not been for such unification, it is extremely doubtful that the Port of New York would have been able to stand up under the pressure put upon it. As it was, congestion and delays incident to the old-time methods of doing business very materially added to the terminal costs.

"The argument has been made, and made without understanding of the subject, that there must be competition. That is not so. Competition in railway operation is the one competition that works against the public, and not for them, because it adds to the cost of the operation, and that is exactly what the Inter-State Commerce Commission had in its mind a short time ago when it declared for a policy of unifying the railways, so that there would not be more than sixteen or eighteen of them in the whole United States. . . .

"There is no disagreement anywhere on the facts set forth about the present condition. It has been recognized by even those who have not been in accord with the creation of the Port Authority or the development of the port by joint action between the States

"The plan set forth for the development of the port is the result of intensive study on the part of the best engineers and terminal experts that could be gathered together in this country. Advising with them were the experts and engineers of the great trunk lines, the representatives of the great steamship companies, and traffic managers of great industrial plants, and it is entirely deserving of approval by the Legislatures of both States and without delay.

"Delay is dangerous if competition with our canal system and our port by the St. Lawrence Waterway is to be avoided. If the port is to stand in healthy competition with the other ports of the country, and if the people themselves in the great metropolitan district are to reap the full benefits and blessings that should flow to us from the greatest natural harbor in the world — a gift of Almighty God himself and fashioned with his own hands — the work should immediately be begun."*

* *The Outlook* for March 22, 1922.

CHAPTER XXXI

THE CANAL IN ITS RELATION TO OTHER WATERWAYS AND THE COUNTRY AT LARGE

Nation-Wide Influence of Erie Canal—Review of Early, Later and Present Influence—Testimony to This Influence—The Barge Canal a Connecting Link—The Intracoastal Chain on the East—Its History and Physical Features—Details of Its Present Status—Great Lakes and Connected Waterways on the West—A Rival Project, the St. Lawrence Ship Canal—Reasons for Desiring a Ship Canal—Its Strong Appeal—Contrast between the Rival Projects—Inception of Present Scheme—The Progress Made—Opposition Aroused—Recent Contest in Congress—Present Status—Public Debates by Two Governors—Claims by Advocates—Other Details—Arguments of Opponents—New York's Position—Study Showing Wide Influence of Barge Canal.

THE ERIE canal, in the broad field of its influence, has always been more a national than a state institution. From the day when President Madison, as one of his last official acts, vetoed a measure which would have given national assistance in the form of western lands—from that day till the present, down through the years of more than a century, in which New York has built and rebuilt and maintained its waterways, the chief branch of the system, the Erie canal, has brought quite as much of benefit to the country at large as to the State itself. After the President's veto the New York commissioner returned from Washington to Albany and recommended that the canal be undertaken by the State alone, remarking that "if the bounty of Congress had granted the entreated boon, it would have been merely the purchase, at less than its cost, of a most valuable object, by paying for it a tract of unsalable land."

It was on March 3, 1817, that the President had refused national aid. On November 4, 1825, eight years, eight months and one day later, there entered New York harbor from the north a fleet of vessels decked in gala attire, the first boats to traverse the length of the completed canal, and the city turned out en masse to welcome them and then joined in a celebration, the like of which had never been seen in the western hemisphere. New York alone and unaided had built a mighty canal, which stood before the world as the model for canal building for a half century and incidentally paid for itself

in less than twenty years. The part played by this canal in the development not only of New York state but of the whole territory in touch with the Great Lakes is well-known history and need not be repeated here.

"This canal," said a writer recently, "was the great western trunk-line of America for nearly forty years before any railroad system successfully competed with it. Not only did it provide cheap communication between the Great Lake states and the Atlantic seaboard, but it made possible the development of a large export grain trade. In this capacity it was supreme for another twenty years, but in 1869 the Pennsylvania and the New York Central railroads were completed to Chicago, followed in 1874 by the Baltimore and Ohio and the Grand Trunk. The freight wars which resulted reduced freight charges to a point which nearly bankrupted the railroads and incidentally cut heavily into the traffic of the Erie canal. The situation was adjusted about 1876, but rates never returned to their old level and canal traffic began to suffer. The State of New York endeavored to meet the situation in 1882 by abolishing tolls and further undertook progressive enlargement of the canal to permit the passage of larger boats, carrying heavier cargoes, but the export grain traffic via canal continued stationary or declining. This was due to several changes. Railroad rate-cutting had taken the grain from the canal and it did not return, but more important, perhaps, the territory that originally produced the grain for export was in Ohio, Indiana and Illinois, and as population grew there, the surplus grain fell off. Little by little the grain territory producing a surplus for export was pushed out into the Northwest, whence once loaded on cars, the grain went through without change. At the present time the surplus grain producing area has been pushed from Minnesota through the Dakotas and through the Canadian northwest, where it bids fair to remain. . . .

"The reconstruction of the Erie canal, as a Barge canal system, was stimulated in part by the desire to secure through the port of New York the export grain trade from the Great Lakes region, especially the Northwest, but in part also by the realization that industrial development in the northeastern states had reached a point where a trunk-line waterway system was again economically desirable. Transportation by modern barges between the Great Lakes and the seaboard is desired in many other lines than the grain trade. Coal, ore, building material, iron and miscellaneous freight of many kinds can pass between Lake ports and not only the port of New

York but all the north Atlantic seaboard territory. This assumes the completion by the Federal government on modern plans of the Atlantic trunk-line waterway, as originally sketched by Franklin and Washington. It enlarges the field of service of the New York system, the distribution of freight making it the connecting link between two great arteries of commerce — the Great Lakes and the thickly settled industrial and agricultural region between Boston and the North Carolina sounds. It is not alone as a State utility that the best returns on New York's great investment will be secured. This rather depends upon making New York, Buffalo and intermediate waterway points a central line for traffic gathered on the way from Buffalo to Duluth and in turn from Boston points, on Long Island Sound and the Connecticut river, from New Jersey points and on the Delaware river, Chesapeake bay and the North Carolina sounds.

"New York representatives in Congress have again a reason to urge Federal activity in waterway construction, not for the purpose of gaining allotments of public lands to pay for a canal built in New York, but for the purpose of urging completion by the Federal government of an improved system of Federal waterways, to take advantage of a great opportunity provided by their public spirited State and at a total cost to the Federal government much less than that willingly incurred by the citizens of New York." *

The strongest testimonies to the wide-reaching, beneficent influence of the Erie canal have come, not from its most ardent friends, but from those who have had no particular concern in its welfare and in some instances from those even who are counted among its enemies. The testimony from the latter class is most important, because it comes as an unwilling confession rather than as a voluntary tribute and has the binding force of evidence elicited under cross-examination.

The volume of this testimony from what we are terming extraneous sources is exceedingly large, but probably the strongest and the most convincing as well as the best known instance is the report of the Windom investigating committee, to which reference was made in our earlier pages and which declared that the Erie canal had done more to advance the wealth, population and enterprise of the western states than all other causes combined and that the only hope of the people against the combined influence of the power and

* Article by Wilfred H. Schoff, Secretary of the Atlantic Deeper Waterways Association.

capital of railroads lay in the Erie canal. Senator Windom himself in a speech on the Senate floor said that Erie canal rates exerted an influence over all other rates from the Gulf States to the St. Lawrence river and from the Atlantic ocean to the foot-hills of the Rockies. In connection with this investigation a railroad man, Albert Fink, doubtless the highest authority on transportation in the country at the time, said that the Erie canal regulated the rates not only on the railroads of New York state but on every trunk line connecting the Lakes with the Atlantic and also in the southern states generally, until it reached the line of influence of low ocean rates.

These words of recognition were spoken of the old Erie canal, but they may be equally true of the new canal, so its friends think, when adequate shipping shall have been provided. But the special purpose of referring to these opinions, which, emanating from persons who were not New Yorkers, were free from local bias, is to show the wide influence exerted by a canal that follows, as does the New York waterway, a certain favored route, the only feasible route in fact in the United States between the Great Lakes and the Atlantic ocean.

Of like import with the opinions just referred to is a speech made by one who had the opportunity by personal experience of knowing thoroughly the commerce of the United States. His sympathies, to be sure, were with New York, but his grasp of the subject and his business relations embraced the whole country. We quote a part of this speech.

"The highway across the state of New York," he said, "from the Atlantic to the Great Lakes and the Mississippi valley is the controlling factor over transportation in North America. Every other route from the base of the Rockies to the coast necessitates mountain climbing. Consequently the rate-making influence of the two New York Central lines and the Erie canal is paramount. Not only are rates to and from the east affected by this competition but the rates south to the Gulf and north to the St. Lawrence also come under its influence. This natural competitive influence is far more effective than the artificial restrictions imposed upon the railroads by the Interstate Commerce Commission for commercial policing purposes, and this is true in spite of the fact that one of the principal aims of these restrictions had been and is directed against the commerce of the Port of New York.

"It is surprising to what a comparatively slight extent this basic natural opportunity of the State has entered into the discussion of

its public affairs. The Empire State has never since the early days of the Erie canal availed of its opportunities as it should have done. Had it done so, its wealth and population would exceed present numbers." *

The office of the New York canal as a connecting link between the Lakes and the ocean is not the least of its good qualities. It has always been such a connecting link, of course, but now, because of the modern renaissance of waterways, it has become a link between two great systems of waterway improvements — improvements which in part have already been accomplished and in part are still only prospective. To some extent these systems are merely enlargements of earlier canals or revivals of former schemes, but never before have plans been so well laid or public sentiment so thoroughly organized for their fulfillment as now, and their fulfillment, moreover, as complete systems.

At the eastern end of the Barge canal lies the system of intra-coastal canals reaching from Maine to Florida and thence to the Gulf of Mexico. It was to promote this scheme in all its several parts that the Atlantic Deeper Waterways Association came into being about a decade and a half ago and it is the consummation of this scheme in its entirety, a condition which is essential to its full usefulness, that the Association, aided by a host of interested supporters, is striving zealously to attain.

This is no new scheme. It dates back to colonial times. A great stimulus to canal-building came in America in the days when there were few improved roads in the colonies and railroads were as yet unknown. The small canal was a much more efficient carrier of freight than any road built after the fashion of the time, and as the settlements were principally east of the Alleghanies a water trunk-line along the Atlantic coast was looked upon by many as the best solution of the transportation problem. The advantages of this scheme were pointed out as early as 1769, when Benjamin Franklin and others submitted to The American Philosophical Society in Philadelphia a plan for the construction of connecting ship canals between the various bays and sounds, substantially along the route now agitated by the present Association. Subsequently the movement was strongly encouraged by George Washington, who went much farther and sketched out a plan for connecting the coastal waterways with the Great Lakes and the Ohio river. Also every

* Calvin Tomkins, Commissioner of Docks, New York city; paper read at convention of New York State Waterways Association, November 2, 1911.

American President from Washington to Jackson featured canal-building and river improvement as important items in the economical development of the country. But the nation was poor and canal-building on a large scale was beyond Federal resources. Moreover State jealousies were still strong and there was a disposition in Congress to discourage enterprises that would develop one state faster than the others. Under Washington and his immediate successors the Federal government joined in organizing corporations to construct the Chesapeake and Delaware, the Chesapeake and Ohio and the Dismal Swamp canals and purchased large blocks of stock of those corporations, but progress along the whole extent of the coastal project has been but gradual and very slow.

The many bays and sounds and peninsulas and islands along nearly the whole extent of the Atlantic coast form well-nigh ideal conditions for intracoastal canals, making possible an almost continuous system with a minimum of construction. Moreover this chain of protected coastal waterways has many potential benefits, commercial, military and naval, to bestow upon the nation, but of this it is not necessary now to speak. The essential need of a link to connect this system with the great inland seas and their adjoining waterways does, however, concern us. The present plans for the intra-coastal canals call for modern and, for the most part, deep channels. The link that connects the system with the Great Lakes, the New York Barge canal, but just now enlarged and thoroughly modernized, occupies the most strategic canal location in the whole country. Aside from its importance in its own right it is almost equally important as a link to join two great systems which together and by means of this connecting link establish a vast system of inland waterways that penetrates to nearly all parts of the eastern half of the country.

Our principal study of course concerns the Barge canal, but it is very important to know what part the New York canal plays in the broad waterway scheme of the whole country, and so it is pertinent to include here an account of the present status of the intra-coastal projects.

The Boston-Beaufort section, according to present War Department recommendations, has a minimum depth of 12 feet. From Boston to Sandwich, through Boston harbor and Massachusetts and Cape Cod bays, there is natural open water navigation. From Sandwich to Buzzards bay there runs the Cape Cod canal, 8 miles long with 25 feet depth at low water, built by a private corporation

but authorized for Federal acquisition by the 1917 River and Harbor Act, with a report as to price now before Congress. From Buzzards bay to New York, through Buzzards bay, Block Island sound and Long Island sound, there is open water. At New York the further improvement of East river, Bronx kills, Harlem river and Spuyten Duyvil creek has been recommended by the War Department and in part authorized by Congress.

From New York to Raritan bay, through Kill von Kull, Arthur kill and Staten Island sound, further improvement has been recommended by the War Department and in part authorized by Congress. From Raritan bay to Delaware river, through the New Jersey intra-coastal canal, 33.7 miles long, construction has been recommended by the War Department and the right of way pledged by the State of New Jersey. Between Bordentown and Philadelphia, through the Delaware river, a 12-foot Federal channel has been completed from Trenton to Philadelphia.

Between Philadelphia and Delaware City, through the Delaware river, a 35-foot Federal channel is under construction from Philadelphia to the sea. Between Delaware City and Chesapeake City the Chesapeake and Delaware canal, 13.7 miles long, was purchased by the Federal government in 1919 and has been operated as a toll-free waterway. The War Department has recommended improving the canal by removing the locks and bringing it to a tide level with 12 feet depth. From Chesapeake City to Norfolk, through Elk river, Chesapeake bay and Hampton Roads, there is open water.

From Norfolk to Albemarle sound navigation is by means of a Federal inland waterway which has been provided by the purchase of the Chesapeake and Albemarle canal by the Government and its conversion into a tide-level waterway of 12 feet depth. From Albemarle sound to Pamlico sound there is navigation in a Federal inland waterway by a present route via Croatan sound, but a project for improvement via Alligator and Pungo rivers has been recommended by the War Department and adopted by Congress and work is under way. From Pamlico sound to Beaufort inlet, N. C., through a Federal inland waterway, the improvement via Neuse river and Beaufort cut has been substantially completed.

The Beaufort-St. Johns river section, according to present War Department recommendations, has a minimum depth of seven feet. From Beaufort inlet to Cape Fear river and from Cape Fear river to Winyah bay, S. C., outside routes are now used and the Federal inland waterway recommended by the War Department follows

largely existing sounds and thoroughfares. From Winyah bay to Charleston, S. C., the Federal inland waterway recommended by the War Department is to be secured mainly by deepening existing channels along an inside route now available but of limited depth. From Charleston to Savannah river an inside route of six feet depth at low water now available has been recommended by the War Department for Federal improvement to the standard depth. From Savannah river to St. Johns river, Florida, an inside route of seven feet depth at low water now available has been recommended for Federal improvement mainly by widening at narrow points.

If this intracoastal chain of waterways were all improved, it would afford a continuous navigation of about 1,800 miles.

At the western end of the Barge canal lie the great inland lakes with their natural navigation of about 1,500 miles. But these lakes do not constitute the whole of the waterway system, existing or contemplated, of the Middle West. Numerous canal schemes have been agitated since the Barge canal was begun and some of them have passed from the stage of agitation into that of preliminary surveys. Of these there are four in the region of the Great Lakes which are worthy of notice. If built, they will be in effect extensions of New York's Barge canal and their efficiency will depend in large measure upon the Barge canal, since it forms the outlet between them and the sea. These four proposed canals are, first, the Lake Erie and Ohio River canal, which would join the Ohio river at Pittsburg with Lake Erie, and for which complete surveys and estimates have been made by the States of Ohio and Pennsylvania; second, the Lake Erie and Lake Michigan canal, surveyed by the United States engineers and joining the heads of Lakes Erie and Michigan by a line only one-third the length of the present natural route, thus bringing Chicago, Milwaukee and Grand Rapids that much nearer to the eastern states and the ocean; third, the proposed improvement of existing canals in Illinois, which extend between Lake Michigan and the Mississippi river; fourth, a canal from the head of Lake Superior to the cities of Minneapolis and St. Paul.

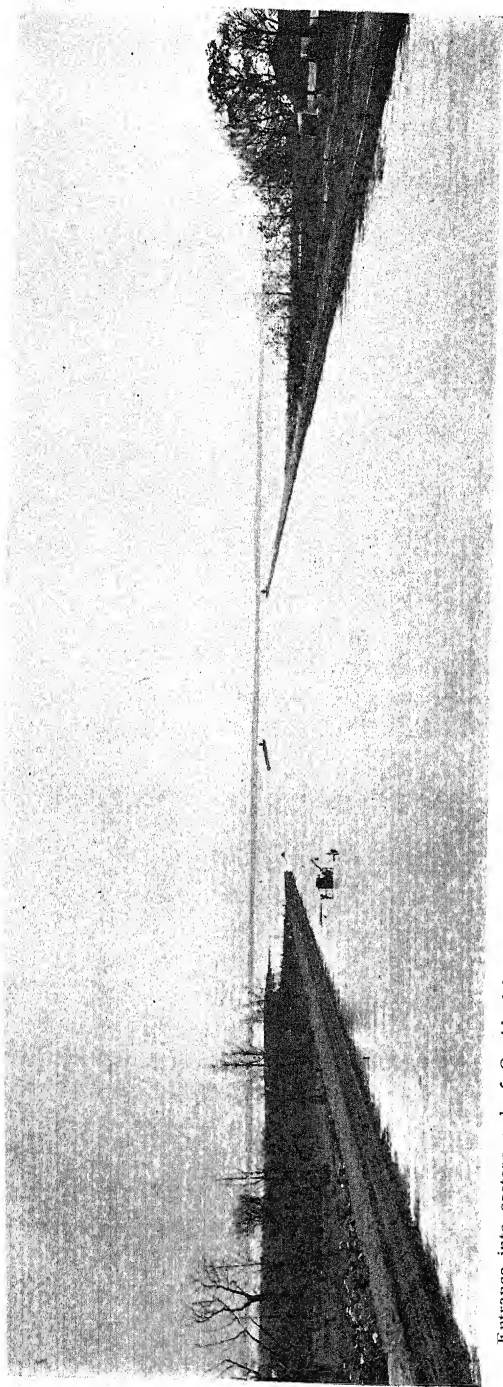
For all of these projects the Barge canal furnished standards upon which to base both dimensions and plans. The engineers who were about to undertake the surveys visited the New York canal before beginning their work. In some cases also the services of Barge canal engineers were secured to assist in planning the proposed waterways. Of the four projects mentioned, little has been heard

recently concerning the Lake Erie and Lake Michigan scheme or the canal from Lake Superior to Minneapolis and St. Paul. The Ohio River and Lake Erie project, however, is still a live issue and, because of the importance of the region to be served and the great volume of prospective traffic, it seems probable that eventually this canal will be built. Illinois is now improving its canals and there are indications that these improvements may be rather extensive before they are all finished.

Thus it appears that both the existing and prospective mileage of waterways connected by the Barge canal and also the extent of territory influenced by its building are very great. Even now the 1,500 miles in the Great Lakes and the 800 miles of New York waterways form a mighty system. If, however, all or even part of the canals and improvements adjacent to the Great Lakes and also the Atlantic intracoastal chain with its navigation of 1,800 miles are eventually built, the area coming under the influence of the Barge canal will indeed be vast.

Since Nature's most favorable route for a canal between the interior and the coast lies in New York, the State in serving itself of necessity, as we have seen, had to serve others. While it is probably true that the primary purpose in its canal-building has been to serve itself, still it cannot be said with truth that New York has been entirely selfish. Rather the opposite is true. Doubtless, however, the State should not have been compelled single-handed to build and maintain for a century and more the waterway which has regulated the freight rates for half of the country and which has been the only means of combating the large outlays made for the avowed object of diverting the traffic of the interior from American to Canadian channels, but to those who are familiar with the circumstances New York's generous purpose has seemed genuine. In spite of this action, however, rival canals have been agitated and the latest of these, the proposed St. Lawrence ship canal, threatens the success of the Barge canal to the extent at least of so diverting attention as to make it difficult for the New York canal to prove its value.

Soon after the Barge canal was begun there was a movement on foot for a fourteen-foot channel up the Mississippi and on to the Great Lakes. This was known as the Lakes-to-Gulf project and it was sponsored by the Mississippi River Improvement Association. The scheme received a severe blow in June, 1909, when the board of Government engineers, having investigated the section from St. Louis to the Gulf, reported to Congress that such a waterway was



Entrance into eastern end of Oneida lake. Concrete breakwater piers, extending about 1,600 feet into the lake, protect the entrance from shifting sandbars and maintain a straight course for sailing boats. The shifting sands of this region have added greatly to the problems of construction and maintenance. The sailing course is straight for nearly 14 miles, lying on a line between the Sylvan Beach and Frenchman's island lighthouses. At the breakwater ends appear the smaller lights. The shifting sands of this region have added greatly to the problems of construction and maintenance. The sailing course is straight for nearly 14 miles, lying on a line between the Sylvan Beach and Frenchman's island lighthouses. At the breakwater ends appear the smaller lights.

not desirable. These engineers estimated the cost of constructing the portion they investigated at \$128,000,000 and the annual maintenance charge at \$6,000,000. One reason for the failure of this project was the fact that, although it promised to benefit commerce between the Lakes region and the southern hemisphere, it had nothing to offer in the way of better traffic relations with European ports. This fact is most strikingly illustrated when one considers what would happen to a shipment starting from the head of Lake Superior and going to Liverpool by way of the Mississippi. After it had gone 2,000 miles and reached the mouth of the river, it would still be 4,500 miles from its destination, no nearer than at the beginning of its journey.

After the adverse Federal report this Mississippi project lay quiescent and the association became inactive till the St. Lawrence scheme was conceived. Then the organization served as a nucleus about which to build the new movement.

In discussing the St. Lawrence ship canal project, which contemplates a channel of sufficient size to enable ocean-going vessels to penetrate to the Great Lakes, we must remember that an intense controversy has arisen over the matter and that the two sides of the question have little in common; in fact they are almost diametrically opposed. Moreover the subject is rather complex, but stripped of its minor features it resolves itself primarily into the question of ship *versus* barge canals. It is not, however, a simple question of ship or barge canals; it involves the problem of a ship canal to reach points ranging from a thousand to twenty-five hundred miles inland. Territorially the contest is between nearly a score of states, mostly Middle Western, and the rest of the country, particularly New York, since she, because of her own waterway, is the chief exponent of the barge canal principle, and also since her metropolis would suffer most if any considerable amount of commerce were diverted to the proposed Canadian route.

To understand the enthusiasm the St. Lawrence scheme has evoked we must realize that the Middle West very acutely feels the lack of adequate transportation; also that, through a just pride in the remarkable growth of the region and a feeling that it is too important longer to tolerate inadequacy, these states absolutely refuse to brook further restraint. Moreover in the scramble for world trade the Lakes region evidently appreciates in full measure its serious handicap of remoteness from the coast and is trying to overcome the disadvantage.

This attempt to carry the coast inland is a subject of supreme importance to the whole country as well as to the Middle West. Let us consider one particular phase of it briefly. The marine commercial development of a country is not solely a matter of bringing ships to its ports and carrying away the products found close to its shores. It is the heart of the country, the vast inland stretches, that must be depended on largely to fill the holds of ships and make their operation possible. In the United States the shape of the country presents a grave difficulty in reaching its heart. We are confronted by a solid block of land, 3,000 miles across from ocean to ocean in a longitudinal direction and 1,600 miles from north to south, without a single salt-water bay or indentation reaching a hundred miles directly inland. In all this vast area, moreover, there are but three navigable slits, the Mississippi, the Hudson and the Columbia rivers, and of these the Hudson and its artificial connecting links form the only watercourse running east and west, the direction most desirable for an outlet to the world's marts. In contrast the countries of Europe, our chief rivals in trade, are lavishly supplied with penetrant arms of the sea. The continent is one fretwork of bays and indentations. Every nation except Russia is thoroughly marine, since the heart of none is more than three hundred miles from salt water. And to supplement their natural advantages the most elaborate systems of artificial waterways and improvements in the world are found there.

This is no new situation, it is as old as the continents and the waters themselves; but it explains several things nevertheless, and the realization of the fact has become more acute of late because of changing conditions at home and abroad in industrial and commercial affairs. A review of the situation, moreover, helps to clarify our understanding of the reason why the ship canal idea is so popular and so persistent and why it is so necessary that a territory two thousand miles inland should have cheap water transportation. We learn from this review also why New York built her canal, but her conclusions and her method of procedure differed widely from those of her sister states.

Looking at this situation from the standpoint of the whole nation we know that, although lacking natural indentations of the sea, we must in effect extend our littoral many miles inland. This is absolutely essential. We must compete for the foreign trade. For the sake even of our home trade we must do this. Otherwise we shall relapse into a hermit nation and history tells us that such a condition would be fatal.

There are many evidences that the Middle West never relinquished the idea of eventually having a ship canal from the ocean to the Lakes. And to be sure it is pleasant fancy, not easily given up, and one to tickle the imagination; there is a fascinating glamour enveloping the thought of giant ocean ships sailing to the heart of the continent and there exchanging the products which they have brought from the uttermost parts of the earth for the grain, the lumber and the ore of the vast Northwest. The advocates of the St. Lawrence project have used to the full the magnificent appeal in this idea. They have played upon the almost universal human tendency to prefer the spectacular to the commonplace and have taken advantage of the natural trait, at least the American trait, to regard the biggest of its kind as necessarily the best.

The St. Lawrence promoters affect to despise the Barge canal. Doubtless they would consider it presumptuous to make comparisons between the two projects, especially to the disparagement of the ship canal scheme, but so pronounced is the contrast between them that one who has studied the history of each enterprise cannot fail to be forcibly struck by it. This contrast may be presented in the form of two pictures, one in retrospect, one now in full view, and our description, we think, is not overdrawn.

On the one hand we see New York deliberately and dispassionately considering the problem of building a canal from ocean to Lakes, appointing a commission of unbiased and level-headed business men and capable engineers to evolve the best plan, and then, after careful surveys and full discussion, proceeding resolutely to carry out that plan and moreover to bear alone the whole expense despite the fact that the cost would be enormous and the further fact that others would enjoy the benefits of the enterprise quite as much as would the State itself.

In the other picture we see a score of states wildly enthusiastic over a project that has not the support of scientific investigation to test its practicability or even of accurate surveys to determine its cost. We see these states complaisantly adding a stupendous water-power scheme to the original project in order to gain the help of states not interested in the canal alone. We see them calmly ignoring the fact that the proposed canal if built would be almost useless without the expenditure of a vast sum for deepening lake harbors. Also we see them even depending on the overwhelming power of a project backed by national approval to convince a lukewarm or, it may be, a reluctant sister nation of the advantages of coöperation.

Then we see them marching upon Congress and demanding not an unbiased investigation and a thorough survey but an immediate undertaking of the work, the United States to join with Canada in paying for the cost, thereby letting the interested states go free, although the total United States expense according to their estimates is only about three-quarters of the amount New York alone paid for its new canal. Finally we see these states endeavoring to push this measure through Congress willy-nilly in spite of grave doubts in the minds of all save the advocates themselves that ocean shipping can ever be induced to penetrate to the Lakes and in the face of protests demanding that, before so monstrous and so far-reaching a policy shall be adopted, precisely what is being undertaken must be known and its cost determined beyond reasonable question.

Although there had evidently been slumbering in the minds of middle westerners for a considerable time the idea that some day there would be a ship canal from ocean to Lakes, the genesis of the present movement may be traced to a certain public meeting and to a particular individual. But the proposition, put thus in concrete form, became popular at once and its advocacy spread rapidly. Whole states were enlisted in the cause and their legislatures appropriated funds for its furtherance. After most of the central section of the country had been brought into line the advocates launched out into wider territory. It was to gain New England that the water-power idea was added. In brief the scheme is to provide a 25-foot or possibly a 30-foot channel for ocean vessels and to develop the power incidentally created in canal construction. The length of new channel work needed to carry out this plan is comparatively short, only a few miles, but nearly all such places lie in Canadian territory and also the length of the St. Lawrence river from ocean to Lake Ontario is nearly twelve hundred miles. Moreover by far the greater part of the river flows through Canada, only about a hundred miles at its upper end being a national boundary stream.

National public attention was first focused on the St. Lawrence project when a clause in the Rivers and Harbors bill of the 65th Congress authorized a joint investigation by the United States and Canada. Immediately after the introduction of this measure and before final action could be taken bitter opposition arose, but the ship canal forces were too strong to be defeated in the time then available and all that the opponents could do at that juncture was to have an amendment added for an all-American route, authorizing a survey for a ship canal between the Great Lakes and the Hudson

river. The investigation was to determine "what further improvement of the St. Lawrence River . . . is necessary to make the same navigable for ocean-going vessels." The investigators were ordered also to make recommendations concerning coöperation by the United States with Canada for the improvement.

In accordance with this Congressional mandate the investigation was duly made. The opponents of the project, however, consider that they were not given equal opportunity with their rivals to present their side of the case. The report of the International Joint Commission favored the proposed canal but counseled further and complete investigation. Thereupon, however, a bill was introduced in Congress to take steps immediately for its construction.

But meantime a considerable portion of the country had been aroused to deep interest in the proposition. The advocates had been well supplied with money from the beginning and all through their campaign by means of continuous publicity and agitation they have been tireless in their efforts to gain and keep adherents. The opponents on the other hand have had very little money to spend and have not been so well organized. Still they have been able to reach a large portion of the public through the newspapers. At the suggestion of the Superintendent of Public Works the New York Legislature created a commission to care for the State's interests and Governor Smith appointed as members of this body, Senator L. W. H. Gibbs, chairman, Senator James J. Walker, Assemblymen S. L. Adler and Charles D. Donohue, State Engineer Williams, Superintendent of Public Works Walsh, Murray Hulbert, Commissioner of Docks of New York city, and Henry W. Hill, President of the State Waterways Association. These commissioners appeared at the hearings of the International Joint Commission. Also at other times and in other places they have endeavored to spread abroad information to confute what New York regards as the chimerical and perilous doctrine of a ship canal to the Great Lakes. A valiant champion of the State's cause appeared in the person of Governor Nathan L. Miller. Soon after assuming office Governor Miller showed a deep concern in the affair and through his public utterances he has been able to accomplish more probably than any one else in whatever success the opposition has achieved.

One of the means employed to spread information was an excursion over the Barge canal during the fall of 1921. We have mentioned this event earlier in the volume. It was planned by various

commercial bodies and interested individuals of the state and the company taken on the trip comprised Congressmen, shippers and others from a rather wide territory, including the Middle West, the South and the Southwest. Apparently the effort was successful; the visitors seemed to be converted to the barge canal idea. They acknowledged that their previous conception of the New York waterway was that it still was the shallow, old-fashioned canal of the past.

After the bill for the St. Lawrence canal was introduced in Congress counter moves immediately were made. One was for a ship canal all in New York state, to be built by a private corporation. This was not a new scheme; it had been presented to the Federal Power Commission in January, 1921; it was a plan advanced by Millard F. Bowen, of Buffalo, who proposed to form a corporation to be known as the Great Lakes to Hudson Ship Canal Company, which would build and operate at its own expense a toll-free ship canal of 30 feet depth, traversing New York territory but utilizing Lake Ontario from Olcott to a little east of Oswego, on condition that it receive the income from the water-power to be created and from terminal charges and a few other incidental sources.

Another counter measure was a bill introduced by Representative Ten Eyck of Albany, proposing that Great Britain cede to the United States all Canadian territory south of St. Lawrence river and St. Lawrence bay, the value of this land to be deducted from the war indebtedness owed to the United States by Great Britain. This measure of course could scarcely be taken in earnest except as it showed the justice of the claim that the United States, if it were to pay its share of the proposed St. Lawrence canal, should own all of the land on one side of the channel and thereby be able to have equal rights with Canada. A somewhat similar but more moderate proposition was contained in a resolution introduced by a senator from Utah. This measure called for the cession to the United States of Canadian territory south of the St. Lawrence and west of the Richelieu rivers.

The St. Lawrence measure seems to have been blocked for the present. In consideration for items in the Rivers and Harbors bill for various local improvements sufficient support was arrayed against the canal project to prevent its passage. This action, however, cannot be charged to New York's account; the State has waged only a fair and open fight. President Harding's action has also postponed

further legislative progress for a time at least. The President has declared himself in favor of the canal, but he has taken the stand that before anything else is done treaties preliminary to its accomplishment must be made with Canada and Great Britain. He directed Secretary of State Hughes to begin negotiations for such treaties. Canada has in effect declined to enter into such a treaty.

Two events to attract wide-spread national interest since the St. Lawrence bill was introduced were debates on the measure by Governor Miller of New York and Governor Allen of Kansas. These took place, one at the annual convention of the National Rivers and Harbor Congress, held in Washington, and the other at Chicago. The prominence of the debaters as well as the importance of the subject gave the affairs much publicity.

It is not necessary to say much more concerning the St. Lawrence project. The subject is both too large and too complex to treat exhaustively without giving it more than suitable space. There have been arguments almost without end on both sides. Moreover it cannot be denied that there have been foolish things said on both sides. A believer in the Barge canal, however, can see little excellence or reason in the claims of the advocates, while he can see much to criticise and condemn.

The desperate need of the Middle West for better transportation is conceded by everybody, but that need constitutes no argument to prove that the proposed canal will satisfy it. And yet such plea, reiterated ad infinitum, has been the chief argument in its behalf. One gross overstatement along this line was brought out in one of the debates between Governors Miller and Allen. In refutation of a total tonnage of 200,000,000 tons estimated to be available for export from the Great Lakes region and vicinity it was shown that only 54,000,000 tons were exported annually by the whole country. The other principal argument is the claim that the cities on the Lakes will become seaports. This premise of course is fundamental; on it stands or falls the whole project. The opponents consider that the claim that ocean vessels will penetrate the continent for the hundreds and even thousands of miles necessary to reach these inland ports is absolutely and undeniably without authoritative support and also contrary to all probability. It was the careful investigation by a Federal engineer that first showed the relative economy of a barge canal to the Great Lakes and it was this investigation which brought to naught the United States Deep Waterway plans for a ship canal and which also induced New York to select the barge size for its new

waterway. So far as we are aware no other competent investigation has ever been made on this subject and nothing has occurred to disprove the conclusions of the one careful study.

But it is not our province to debate the question. Briefly, however, we may mention a few more incidents. Early in the agitation State Engineer Williams said that if there really must be a ship canal, although in his opinion it was not necessary, the logical course for it was the Oswego-Oneida-Mohawk route, substantially that of the Oswego and eastern Erie branches of the Barge canal. Recently Superintendent of Public Works Cadle has voiced much the same proposal. Also a prominent Canadian engineer has given it as his opinion that the best solution of the problem is a channel for ocean vessels up the Hudson and a meeting between ocean and lake boats in the vicinity of Albany or Troy. This is almost precisely the idea advocated by certain New Yorkers—a combination of the Deeper Hudson and Barge canal projects. Whether under this scheme the Barge canal is of sufficient size to meet all the needs is as yet undetermined. There have been some attempts to develop a type of boat suitable for both Great Lakes and Barge canal navigation, but entire success has not crowned the venture and also there is question whether such a thing can be done successfully. If, however, it should be necessary to enlarge the Barge canal between Troy and Oswego, the cost would be small in comparison with the St. Lawrence ship canal. It will be recalled that State Engineer Bensel in 1912 recommended a widening of the narrow portions of this stretch so as to allow two of the larger lake boats to pass one another.

This view of the Canadian engineer reveals a condition which the advocates have ignored. Canada is by no means entirely convinced of the desirability of a joint project. Moreover in all probability a new treaty would seek to readjust the allotment of Niagara waters, and Canada will be very slow to relinquish her present share, which is almost twice that allowed the United States. Also there are evidences of desertion even from the ranks of the Middle West. The city of Cleveland recently received an adverse report from a committee it appointed to make a careful investigation of the whole subject. The general discussion and the wide publicity the topic has evoked since it came before Congress are evidently showing results. And this publicity by the way should redound to the benefit of the Barge canal by advertising its importance and usefulness. A strong name lately to appear among the list of St. Lawrence opponents is

that of General Goethals, the builder of the Panama canal. His opposition was based on the ground of the impracticability of a ship canal to meet the particular need.

Very briefly we shall marshal a few facts which the opponents of the ship canal project have brought forward. In the first place they declare that ocean-going ships, because of their heavier construction and higher cost to build and operate, their method of loading through small hatches and their comparatively slow speed in restricted channels, can never be induced to make such a long trip inland and moreover if they could be induced to give the plan a trial the smaller boats would so outstrip them in economy that further trips would be abandoned. Also the possibility of bringing in and taking out full cargoes without stopping to gather them at several ports would be remote. The absence of accurate data on which to base an estimate of cost is a grave defect. The figures given by the rival contestants are wide apart. The fact, which by the way cannot be denied, that the lake harbors are not deep enough for ocean ships and would have to be improved at a vast added expense, has been a most serious handicap to the success of the scheme. Then too the difficulties of international control, the shorter navigation season and more perilous channel of the northern route, the inability of Montreal to absorb as well as to furnish full cargoes, if ocean ships should not pass beyond that city, these are all objections hard to answer. The necessity for duplicating port facilities to care for ocean traffic during the months when the ship canal would be closed is a great drawback to the acceptance of the plan. Moreover the joining of the canal and the power projects has been a subject of severe criticism. It is said that certain New England power companies are deeply interested because of the probability of gaining substantial profits from the venture. This fact, when known, has not added to the zeal of the people on either side of the border in the vicinity of the prospective power sites.

We spoke of New York being opposed to the St. Lawrence project because she believes in the barge canal theory and because her commerce might suffer from a diversion of traffic, but there are other as weighty reasons. Assuming that the proposed ship canal were built and ocean ships were regularly plying upon it, then probably New York would lose much of her commerce and with it much of her prestige. But if such change should benefit a large section of the land, New York could not well complain. The State, however,

does not believe that ocean shipping would use the canal if built and therefore objects to such a large and useless expenditure, especially as she would be called upon to bear a great part of the cost. What is more likely to happen is this: Ocean vessels would stop at Montreal and lake freighters would meet them there. Not only would this divert commerce from New York, but it would take it entirely out of the country. Such an outcome is most undesirable, New Yorkers think, in view of the possibility of securing equal or better facilities wholly within our own borders and at much less expense. But New York's share of the cost is perhaps the most serious consideration. Because of her wealth and her large population the State pays nearly a third of all Federal expenditures. But of greater import, New York owns the power rights on the American side of the St. Lawrence. If the canalization scheme should be accomplished, the United States would take over these rights as a part of the requirements for navigation and the State would lose a most valuable asset. If it should happen, as the enthusiasts declare, that the returns from power development will repay the whole cost, then New York would find herself in the position of paying the entire United States share by means of the water-powers now owned by her but taken away under guise of navigation requirements. If, as the advocates say, these powers can finance the whole project, then their potential value to the State must now be equal to the enormous cost of the enterprise.

In a word this is New York's position: After having spent her hundreds of millions through a century to build and maintain a canal and then well towards two hundred millions more to rebuild it in such manner as in her opinion to enable it to relieve the traffic congestion from the west or at least to go a long way towards that end — after having done all this, knowing full well that all through the century the states to the west have shared and for the future may continue to share the benefits equally with herself, New York is confronted with the prospect of being compelled against her will to pay nearly a third and perhaps the whole of the cost of a rival canal, and meanwhile to lose priceless water-power rights, although she firmly believes that the expected ocean vessels will not use such canal, that the money will virtually be wasted and that the canal will accomplish little if any more than her own waterway except to divert traffic to a foreign route. What wonder then that New Yorkers are fighting the St. Lawrence project or that they seem determined to continue their battle to the bitter end!

Just one more instance of the wide influence of the Barge canal before we finish. This was brought out in a study made during construction. One result of the opening of the Panama canal was to bring pointedly to the minds of shippers the difference in rates between rail and water-borne transportation. In the lumber trade this difference was seen very clearly. The forests of the East have become so nearly exhausted that for some time the East has had to draw much of its supply from the Pacific coast states. As soon as the Panama canal was opened this traffic began to turn, western lumber coming by boat to Atlantic or Gulf ports and then being reshipped by water or rail to the interior of the whole eastern half of the country. And this came about because the saving in cost was a considerable sum on every thousand feet. A study as to how the Barge canal would extend the limits to which Pacific coast lumber might profitably be shipped by the water route brought out some interesting facts. Two routes were considered, one overland from the Pacific coast by rail and the other by water east through the Panama canal, then back west through the Barge canal and the Great Lakes and continuing west by rail. If we assume that the lumber which has come by boat from the Pacific coast to New York city continues to move by water, reversing its general course and going back west through the Barge canal and on through the Great Lakes as far as they extend, and then if we compare the cost of transportation by this route with the cost to ship the same lumber overland by rail to the same points at the western extremities of the Lakes, we find a balance in favor of the water route, although the distance traveled is several times that by land. Now, if we spend this balance to move this water-borne cargo still farther to the west, using railroads of course, we shall reach a point where the cost of transporting this cargo will exactly equal the cost of the cargo coming overland by rail. Drawing a line through several points obtained in like manner, we shall obtain a boundary which we may call the "line of equal costs." The interesting fact about this line is that it is away to the west of the Mississippi river, scores and in some cases hundreds of miles. The area thus benefited by the Barge canal includes most of the northeastern quarter of the United States, embracing the territory east of this line of equal costs and north of the Ohio river. This area would extend farther south were it not for the fact that the cargo approaches the country from the south and so the Mississippi river and southern railroads from the coast become competing factors.

Experience since the new canal has been in operation has shown that not only lumber but other products of the Pacific coast as well are being shipped to advantage by the all-water route, the combination made possible by the Panama and Barge canals. This is simply one of the many instances which go to show the truth of the statement made at the beginning of this chapter, that the Erie canal in the broad field of its influence has always been more a national than a state institution. The friends of the new Erie, what we have come to call the Barge canal, predict for it as glorious and as useful a service as ever the old Erie had. This end has not yet been attained, but it is possible. It means, however, unflagging zeal and tireless work—in building up an adequate fleet and making the public canal-minded.

CHAPTER XXXII

TABLES OF CONTRACTS

Construction of Barge Canal. Erie, Champlain and Oswego Canals, Work Completed and Work under Contract, Cayuga and Seneca Canal, Work Completed—Construction of Barge Canal Terminals: Work Completed and Work under Contract

IN ORDER not to burden the text of the present volume with too great detail, the contracts under which the Barge canal and terminal construction work was performed have been listed in tabular form and are here inserted under a special chapter heading. From these tables it may be learned when the work at the various localities was undertaken and also what the cost was. There are summaries which give the total costs. It should be said that all these figures represent the cost of construction and do not include the engineering, the purchase of land, awards for damages and interference with vested rights, and other incidental expenditures. The tables show that virtually all canal construction is completed, while on terminal construction, especially the installation of machinery, considerable is still under contract. The logical arrangement in the tables has seemed to be that of contract number, but since no very definite or easily-explainable system was employed in the original assignment of numbers, search for any given piece of work will have to be made until it is found.

It will be seen that the total construction cost of the Erie, Champlain and Oswego branches of the Barge canal, as shown in the following tables, is \$96,685,570. In 1903 it was estimated that this cost would be approximately \$84,000,000, but in 1915 it was evident that this amount would be exceeded, and the reasons therefor are given on pages 246-9 of this volume. Since that time there have been some other extraordinary increases in cost of labor and material, brought about by World war conditions, which tended very materially to increase the total cost of the construction work above either the 1903 or the 1915 estimates.

CONSTRUCTION OF THE BARGE CANAL
WORK COMPLETED ON THE ERIE, CHAMPLAIN AND OSWEGO CANALS UP TO OCTOBER 18, 1922,* EXCLUSIVE
OF THAT DONE UNDER CHAPTER 585, LAWS OF 1918

Contract No.	Canal	Description of work	Contractor	Date of contract	Total construction cost, including alterations and extra work orders
1	Champlain	Northumberland to Fort Miller, and Crockers Reef to Port Edward	Empire Engineering Corporation	4/18/05	\$479,875
2	Erie	Locks 2 and 3 and prism through Waterford	The Ferguson Contracting Co	4/ 3/05	725,630
2-B	Erie	Completion of Contract 2	Holler & Shepard	12/ 8/09	286,135
2-G	Erie	Tamion gate, etc., Waterford side-cut	A A Parker	10/17/16	11,590
3	Champlain	Lock 6 and land line, Fort Miller to Crockers Reef	Sundstrom & Stratton	4/ 4/05	688,129
4	Erie	4½ miles east of Oneida lake	Empire Engineering Corporation	4/18/05	732,657
4-B	Erie	Bridge on Burdick's road adjacent to Contract 4	E J Doyle & Co	12/ 1/10	1,332
5	Erie	Mosquito Point to Fox Ridge	Empire Engineering Corporation	4/18/05	125,820
5-A	Erie	Completion of Contract 5	James Stewart & Co	1/20/12	319,351
6	Erie	N Y C R R west of Rochester to South Greece	P A Maselli	5/ 3/05	1,934,630
7	Erie and Champlain	Superstructure of highway bridges, Contracts 2, 3, 4, 5 and 6	The Groton Bridge Co	8/10/06	102,173
8	Erie	Locks and dams at Scotia, Rotterdam and Cranesville	Pittsburgh-Eastern Co	5/22/06	920,776
8-A	Erie	Completion of lock and dam at Scotia	The Foundation Co	7/ 6/12	907,610
9	Erie	Eagle Harbor to Medina	Thomas Cummings Contracting Co	3/18/08	959,955
10	Oswego	Locks and prism at Fulton	Mc Dermott Contracting Co	6/ 7/06	670,379
10-A	Oswego	Completion of portion of Contract 10	The T A Gillespie Co	12/14/11	168,583
10-B	Oswego	Completion of portion of Contract 10	Oswego Construction Co, Inc	3/ 4/12	533,811
10-C	Oswego	Filling portion of old canal at Fulton	Fulton Engineering Co, Inc	11/18/14	39,904
11	Erie	Locks 4, 5 and 6, guard-gate and prism, Waterford to Crescent	Fort Orange Construction Co	5/21/06	1,221,322
12	Erie	Dredging, Oneida lake to Mosquito Point, Lock 23	James Stewart & Co	9/23/07	3,105,781
13	Erie	Superstructures of highway bridges, Contract 18 and part of Contract 12	Penn Bridge Co	11/ 7/08	23,412
14	Erie	Crescent to Rexford Flats, Mohawk river locks and dams	Acme Engineering & Contracting Co	9/10/07	2,676,042
14-A	Erie	Clearing lands between Crescent and Rexford Flats	John Henkes	10/26/12	0 10
14-B	Erie	Completion of dams at Crescent and Vischer Ferry, removal Crescent aqueduct	Brown & Lowe Co	10/20/14	88,169
14-R	Erie	Removal and reinterment of bodies in cemeteries	Thomas F Riley	11/28/11	629

	Champlain Erie and Champlain			8/ 9/06	
15	Erie	Locks 11 and 12 and prism, Comstock to Whitehall	Atlantic Gulf & Pacific Co		1,388,171
16	Erie	Superstructures of highway bridges, Contracts 11, 25 and 27	The United Construction Co	12/20/06	92,461
17	Erie	Locks and dams at Amsterdam and Tribes Hill	The Scofield Co	12/20/06	53,704
18	Erie	Lock 16, guard-gate and prism, Mindenville to Indian Castle	Alexander Murdoch	3/ 3/08	754,269
18-A	Erie	Completion of work, Mindenville and Little Falls (Contracts 18 and 20-A)	Kelley Bros Contracting Co.	12/28/06	496,585
19	Erie	Canal prism, Sulphur Springs to Tonawanda	N Y State Dredging Corporation	2/17/14	1,603,153
20-A	Erie	Dredging, Mindenville to Little Falls	Great Lakes Construction Co.	11/26/06	825,083
20-B	Erie	Dredging, Canajoharie to Mindenville	Houston Barnard	8/20/09	321,491
20-C	Erie	Dredging, Yosts to Canajoharie	S Pearson & Son, Inc	8/ 2/09	1,018,450
20-D	Erie	Dredging, Rexford Flats to Yosts	American Pipe & Construction Co	8/18/09	1,661,835
21	Erie	Construction, Genesee river to N Y, C R R west of Rochester	American Pipe & Construction Co	8/18/09	3,345,670
22	Erie	Superstructures of highway bridges, part of Contract 12	Lane Bros. Co	4/ 7/10	949,000
22-A	Erie	Substructure, etc., highway bridge at Weedsport	M Fitzgerald	9/24/10	122,912
23	Erie	Locks 32 and 33 and prism, Kings Bend to Genesee river	Lupfer & Kemick	8/ 8/12	27,870
23-B	Erie	Completion of approaches, South Ave bridge, Rochester	Millard & Lupton Co	8/18/09	1,207,720
24	Champlain	Guard-gate at Crockers Reef	Michael E Sweeney	11/ 4/14	4,730
25	Champlain	Locks 9 and 10 and prism, Dunhams Basin to Comstock	Kingsbury Construction Co	11/ 1/11	43,841
26	Champlain	Dredging near Fort Edward.	Atlantic Gulf & Pacific Co	11/19/06	1,547,193
27	Champlain	Locks 7 and 8 and prism, Fort Edward to Dunhams Basin	The Lake Erie Dredging Co	4/ 6/08	35,443
27-A	Champlain	Completion of Contract 27	The Kinser Construction Co	11/23/06	393,535
27-B	Champlain	Division channel for Bond creek	Holler & Shepard	12/ 1/10	548,764
29	Erie	Lock 19 and prism, Sterling creek to Oneida-Herkimer Co line	John J Farrell, Jr	5/23/16	6,043
30	Erie	Lock 18 and prism, Little Falls to Sterling creek	Maryland Dredging & Contracting Co	4/ 3/09	566,502
30-A	Erie	Completion of work, Jacksonburg to Herkimer	Acme Engineering & Contracting Co	7/16/09	2,913,187
31	Erie	Lock 17, Rocky Rift dam and prism through Little Falls	Mohawk Dredge and Dock Co Inc	11/24/16	124,461
32	Champlain	Needle beams, lock gates and valves, etc., Locks 6, 8 and 9	Casey & Murray	9/ 2/08	753,405
33	Erie, Champlain and Oswego	Needle beams, lock gates, guard and sluice gates, Contracts 2, 10, 11 and 15	Penn Bridge Co	4/19/09	44,375
34	Erie	Superstructure, Saratoga Ave bridge, Waterford	Penn Bridge Co	1/ 7/10	170,822
35	Oswego	Locks 7 and 8 and prism through Oswego	M Fitzgerald	8/ 8/06	22,317
36	Erie	Operating winches for Mohawk river movable dams	Gilmour-Horton-Allen Co	9/16/07	676,101
37	Oswego	Locks 5 and 6 and prism, Fulton to Oswego	J D Miller	5/25/10	47,210
37-R	Oswego	Removal of bodies from Minetto cemetery	Henry P Burgard	12/ 9/10	2,669,680
38	Erie	Highway bridge at Wappings, west of Fairport	Saladin & Henrick	11/29/12	3,682
39	Oswego	Dredging, Three Rivers to Fulton	Henry Tost & Son	1/11/09	16,635
40	Erie	Lockport to Sulphur Springs guard-lock	James Stewart & Co, Inc	4/15/10	969,803
41	Erie	Embankment of Irondequoit creek	The United Engineering & Contracting Co	11/27/08	2,113,231
			Butler Bros Construction Co.	12/ 5/08	241,741

* The date has no significance aside from the fact that the tables were compiled then

CONSTRUCTION OF THE BARGE CANAL — (Continued)
 WORK COMPLETED, EXCLUSIVE OF THAT DONE UNDER CHAPTER 585, LAWS OF 1918 — (Continued)

Contract No.	Canal	Description of work	Contractor	Date of contract	Total construction cost, including alterations and extra work orders
42	Erie	Lock 20 and prism, Oneida-Herkimer Co line to Onskany road	Shanley - Morrissey, Inc	7/ 9/09	\$478,670
42-A	Erie	Completion of Contract 42	Grant Smith & Co & Locher .	2/24/13	1,197,578
43	Erie	Onskany road to Mud creek	The M A Talbott Co	10/15/09	1,306,549
44	Erie	Mud creek to east end of Contract 4	Scott Bros	1/ 8/10	1,620,990
45	Erie	Lock 24 and prism at Baldwinsville, dam at Caughdenoy	Scott Bros	5/ 6/08	1,190,510
46	Erie	Lock 25 and prism, Fox Ridge to Seneca-Wayne Co line	The Kinser Construction Co	11/23/08	842,689
46-A	Erie	Completion of Contract 46 from Fox Ridge to Montezuma aqueduct	James Stewart & Co., Inc. .	9/ 2/14	181,338
46-B	Erie	Completion of Lock 25	Scott Bros	2/25/16	270,974
47	Erie	Lock 26 and prism, Seneca-Wayne Co line to Lyons	The Crowell-Sherman-Stalter Co.	11/30/08	833,442
47-A	Erie	Completion of Contract 47	Central Dredging Co	3/22/16	103,740
48	Erie	Locks 27 and 28-A and prism, Lyons to Newark	The Sherman-Stalter Co	12/29/10	1,482,999
49	Erie	Lock 30 and prism, Yellow Mills bridge to Wayne-Monroe Co line	American Pipe & Construction Co	2/21/10	797,544
50	Erie	Dam and reservoir at Hunkley on West Canada creek	The Buffalo Dredging Co.	9/23/10	993,673
51	Erie	Nine-mile creek diverting dam and feeder	The Alto Construction Co.	12/23/10	375,081
53	Oswego	Lock 1 and prism, Phoenix	Scott Bros	8/10/09	105,689
54	Champlain	Lock 7 at Fort Edward	The Hunkin-Conkey Construction Co	12/13/09	223,893
55	Erie	Dam and reservoir at Delta on Mohawk river	Arthur McMullen	10/19/08	884,811
55-R	Erie	Removal and reinterment of bodies in cemeteries	Joseph Kaik & Alfred S Brown	11/ 3/11	7,627
57	Champlain	Improving the Glens Falls feeder	Flood & Van Wirt Co	9/26/12	333,542
59	Erie	Dredging through Onondaga outlet	N Y State Dredging Corporation	8/ 6/12	93,315
59-A	Erie	Sewers, Genesee Valley park to Court St, Rochester	P H Murray	7/ 3/16	110,031
60	Erie	South Greece to Adams Basin	Empire Engineering Corporation . .	8/ 6/08	1,346,261
61	Erie	Adams Basin to Monroe-Orleans Co line	Cleveland & Sons Co	10/13/08	1,048,666
62	Erie	Monroe-Orleans Co line to Eagle Harbor	I. M. Ludington's Sons, Inc	8/11/10	2,854,348
63	Erie	Wayne-Monroe Co line to Kings Bend	H S Kerbaugh, Inc	6/ 3/10	2,993,209
64	Erie	Medina to Gasport	Empire Engineering Corporation . .	8/ 6/08	1,199,980
65	Erie	Prism and structures at Medina	Maryland Dredging & Contracting Co	3/26/13	1,110,918
66	Erie	Gasport to Lockport	Empire Engineering Corporation	9/22/08	783,160
67	Erie	Locks 34 and 35 and prism at Lockport	Larkin & Sangster	9/ 3/10	1,048,772

68	Champlain	Locks 3, 4 and 5 and adjoining prism	Shanley-Morrissey, Inc	11/23/08	947,813
69	Champlain	Lock 2 and adjoining structures	I A Hodge & Co, Inc	12/11/09	231,504
70	Champlain	Dredging, Watford to Lock 1	Shanley-Morrissey, Inc	1/11/10	236,240
70-A	Champlain	Completion of Contract 70	Central Dredging Co	10/22/12	708,842
71	Champlain	Lock 1 and dam and dredging, Lock 1 to Lock 2	Shanley-Morrissey, Inc	1/11/10	826,395
71-A	Champlain	Completion of Contract 71	P McGovern & Co	1/16/13	1,487,701
72	Champlain	Dredging, Lock 2 to Lock 4	Shanley-Morrissey, Inc	12/14/09	618,900
72-A	Champlain	Completion of Contract 72	James Stewart & Co, Inc	3/27/13	1,515,095
72-B	Champlain	Widening prism at mouth of Hoosic river	James Stewart & Co, Inc	7/7/10	92,517
73	Champlain	Dredging, Lock 4 to Northumberland	E M Graves	5/20/10	517,223
74	Erie	Dredging, Mohawk and Hudson rivers below Lock 2, Watford			
75	Erie	Guard-gates within limits of Contracts 60, 61 and 64	Dunbar & Sullivan Dredging Co	2/13/14	215,741
76	Erie	Lock 26-B and prism, Newark to Port Gibson	United Construction Co	3/1/10	43,842
77	Erie	Lock 30 and prism, Port Gibson to Yellow Mills	The T A Gillespie Co	12/23/10	1,401,110
78	Oswego	Dike at Fulton	The T A Gillespie Co	12/23/10	1,691,466
79	Oswego	Superstructure for highway bridge, Bridge St, Oswego	Cunningham-Woodard Co	4/18/10	50,119
80	Oswego	Dam of Phoenix	Lupter & Remick	9/23/10	34,661
81	Erie	Junction lock at Rome	Walter Bradley	1/16/11	112,034
82	Erie	Superstructures of highway bridges on Contract 21	Chesley, Earl & Heimbach, Inc	10/17/16	50,504
83	Erie	Construction, Contract 19 to Niagara river, Tonawanda	Groton Bridge Co	12/7/10	28,708
85	Oswego	Superstructure, lift-bridge, Bridge street, Phoenix	Mohawk Dredge & Dock Co	10/22/17	164,191
86	Erie	Bridge at Canajoharie	Lupter & Remick	8/5/11	12,339
87	Erie	Lansing's bridge, Sta. 4078, Contract 20-A	Lathrop, Shea & Henwood Co	9/23/11	39,104
88	Champlain	Reconstructing portion of bridge at Schuylerville	The P B McCaughey Co	2/17/13	11,400
89	Erie	Bridges between Lyons and Palmyra, Contracts 48, 76 and 77	Lathrop, Shea & Henwood Co	11/4/11	30,844
90	Erie, Champlain and Oswego	Power equipment, etc., Locks 24, Erie, 1, 2, 7, 8, Oswego, and 9, 11, 12, Champlain	Owego Bridge Co	5/28/12	56,205
90-A	Oswego	Power-plants, etc., a Locks 1, 2, 7 and 8, Oswego canal.	D'Olier Engineering Co	4/12/10	178,733
91	Erie	Power-plant, east end of Crescent dam	Lupter & Remick	8/8/12	63,137
91-A	Erie	New governor equipment, Crescent power-house	The Holington Co	1/5/11	43,750
92	Erie and Champlain	Power equipment, Locks 2 to 19, incl, guard-gate above 6, Erie, 1 to 8, Champlain	Lord Construction Co	11/24/16	6,226
93	Erie and Oswego	Power equipment, Locks 20, 21, 22, 23 and 25, N London junction lock, Erie, 3, 5 and 6, Oswego	MacArthur Bros Co & Lord Electric Co	2/17/13	1,209,394
94	Erie	Power equipment, Locks 26, 27, 28-A, 28-B, 29, 30, 32, 33, 34, 35 and guard-locks, Erie	MacArthur Bros Co & Lord Electric Co	8/12/13	364,305
100	Erie and Oswego	Bridges at Long Branch, Belgium and Himmansville, Contracts 12, 39 and 57	MacArthur Bros Co & Lord Electric Co	2/17/13	439,789
101	Erie	Highway bridge at Three Rivers	W J Burns Co	9/12/13	162,757
102	Erie	Bridge superstructure at Howland's island	Barrally & Ingersoll	8/8/12	40,655
103	Oswego	Concrete and bascule bridge at Lock St, Phoenix	Lupter & Remick	2/20/13	24,560
104	Oswego	Reinforced concrete arch bridge at Broadway, Fulton	Barrally & Ingersoll	12/10/12	185,033
			R B Murdock	3/5/12	36,856

CONSTRUCTION OF THE BARGE CANAL — (Continued)
 WORK COMPLETED, EXCLUSIVE OF THAT DONE UNDER CHAPTER 585, LAWS OF 1918 — (Continued)

Contract No.	Canal	Description of work	Contractor	Date of contract	Total construction cost, including alterations and extra work orders
105	Erie	Lift-bridges at Spencerport, Adams Basin, Brockport, Hubertson and Gasport	Skene & Richmond	4/19/12	\$245,688
106	Erie..	Lift-bridges Brockport, Medina, Middleport and Lockport, and guard-gate at Gasport	The W S Cooper Co	5/13/14	274,268
107	Erie	Lift-bridge and fixed bridge at Little Falls	Jackson L Richmond	2/19/13	115,093
108	Erie	Highway bridges near Macedon and superstructures at Peek's and Allerton's	I M Ludington's Sons, Inc.	10/17/13	84,109
109	Erie	Highway bridge at site of Crescent aqueduct	Larkin & Sangster	7/31/14	151,371
110	Erie	Highway bridges at James and Lawrence Sts., Rome	Chesley, Earl & Heimbach, Inc	12/ 3/13	124,239
111	Erie	Steel sheet-piling and slope protection within Contracts 60 and 66	John Young	4/24/13	120,519
112	Erie	Timber for trough at Bushnell's Basin and Holley	Wm J. Dowdle	4/15/13	21,971
113	Erie	Guard-gate above Lock 6, Watertford	Chas A Hager	10/ 7/13	36,908
114	Erie	Superstructure of Movable dam 4, Scotia	Penn Bridge Co	10/28/14	97,042
115	Erie	Bridges at toll road and County line, Contract 46	Walsh Construction Co	1/16/14	77,284
116	Oswego...	Basin bridge over Lock 2, Fulton	Walter S Rae	4/15/18	32,299
117	Erie.	Drying steel sheet-piling cut-off and extending apron, Mohawk river	Lathrop, Shea & Henwood Co	7/29/14	154,611
118	Erie.	Dam 5, Rotterdam	Holler & Shepard	8/ 4/14	50,567
119	Erie.	Changes in Movable dams 5 to 11, inclusive, Mohawk river	Whitehead & Kales Iron Works	7/29/14	283,026
120	Erie	Superstructure of bridge at Sta 2901 +83, Contract 12	General Erecting Co	7/ 8/14	9,110
121	Erie	Highway bridge over Mohawk below Little Falls, Sta 4246 +42.	Thomas Leonard	2/23/16	6,090
122	Erie	Dam and sluice gate across West Canada creek at Trenton Falls	Frank L. Cohen	5/11/14	17,530
123	Erie	Viaduct over railroad at Vischer Ferry	Keith O Guthrie	8/31/14	39,178
124	Erie	Raising existing bridge at Mechanville	Horseheads Construction Co	9/ 4/14	6,101
125	Champlain.	Highway bridge at Northumberland	Holler & Shepard	5/27/16	75,189
126	Champlain..	Freeman's bridge at Schenectady	The Foundation Co	6/ 6/16	82,202
127	Erie	Improvement of Albany basin	Great Lakes Dredge & Dock Co.	4/ 3/16	5,506
128	Erie	Bridge at Schuylerville	Spaulding Construction Co	3/28/16	5,850

131-A	Champlain ..	Completing bridge at Schuylerville ..	M. Fitzgerald.	3/ 5/17	37,916
132	Erie ..	Lighthouses, buoys, etc., for Oneida and Onondaga lakes	Lupfer & Remick....	11/ 3/16	69,669
133	Erie ..	junction lock at Mohawk	Morrison & Quinn, Inc.	10/16/16	42,435
135	Erie ..	Excavating point below Dam 10, Canajoharie	Great Lakes Dredge & Dock Co	9/18/16	48,637
137	Erie ..	Steel sheet-piling at Dam 10, Canajoharie.	J. A. Laporte	10/13/16	17,866
139	Oswego ..	Excavating channel below Lock 8, Oswego	Empire Engineering Co., Inc	11/ 3/16	17,837
140	Champlain...	Bank protection, Hudson river north of Waterford, Contract 71-A ..	Holler & Shepard.	11/ 1/16	4,856
144	Erie ..	Red creek bridges, Genesee Valley park, Rochester	W F Martens & Co., Inc	6/14/17	6,580
144-A	Erie ..	Completing Contract 144...	Brown & Lowe Co. & Law Bros	8/27/17	67,733
145	Erie ..	Raising existing Scotia bridge, Schenectady	Horseheads Construction Co., Inc	1/ 1/17	3,703
146	Erie ..	New movable dam to replace Dam 14, Herkimer	Peckham Construction Co., Inc	4/18/18	89,934
147	Erie ..	Bascule bridge, Main and Webster Sts., Tonawanda	Lathrop, Shea & Henwood Co	9/10/17	254,019
148	Erie ..	Highway bridge across Lock 27, at Beach St., Lyons	Lathrop, Shea & Henwood Co	9/ 5/17	67,878
150	Erie ..	Concrete apron below head gates at Vischer Ferry dam	Brown & Lowe Co	12/ 1/16	22,273
152	Erie ..	Repairing Lock 35, Lockport	Lupfer & Remick	11/15/19	119,597
153	Erie and Oswego	Aids to navigation on Mohawk, Oneida, Seneca and Oswego rivers	R B Wing & Son	2/28/17	4,389
154	Erie...	Additional Tantor gate at Lock 27, Lyons	Lupfer & Remick.	4/ 7/17	8,409
155	Erie ..	Hoists for bulkhead gates, Vischer Ferry dam	Lupfer & Remick.	1/31/17	12,258
156	Erie ..	Highway bridge across Wood creek near Sylvan Beach	Chesley, Earl & Hembach, Inc	8/28/17	9,643
157	Erie ..	Dam across old canal at Rome	Thos Bowen	4/20/17	5,954
158	Erie and Oswego	Buoys and lamp posts for Mohawk, Oneida, Seneca and Oswego rivers	James McKinney & Son	3/22/17	3,127
161	Erie..	Furnishing and delivering electric motors etc at Rochester	Lord Construction Co	8/ 3/17	16,687
162	Erie ..	Drain across canal at Main St., Brockport	Charles A. Ingersoll...	3/27/17	6,456
164	Erie ..	Completing work between Lyons and Newark, and dam at Macedon....	Lathrop, Shea & Henwood Co	10/30/17	223,540
165	Erie ..	Removing Montezuma aqueduct and completing excavation ..	Mohawk Dredge & Dock Co., Inc	11/23/17	146,114
167	Oswego	Bascule bridge at Culvert St, Phoenix	Walter S Rae	10/13/17	28,425
168	Champlain ...	Concrete guide piers near Locks 3, 5 and 6, Champlain canal.	Bronk & Kimmey	7/29/18	89,352
169	Champlain ..	Temporary timber guide piers below Locks 3 and 6	Holler & Shepard	6/28/17	2,883
170	Erie ..	Junction lock and excavation at South Greece	Cleveland & Sons Co	11/10/17	60,096
172	Erie..	Barrel buoys and lamp posts on Seneca, Clyde, Genesee and Tonawanda rivers	Lupfer & Remick	3/15/18	13,819
173	Erie	Lanterns for buoys, etc., on Seneca, Clyde and Genesee rivers	R B Wing & Son	2/ 9/18	8,960
178	Erie ..	Improvement of by-passes at Locks 32 and 33	W F Martens.	3/12/18	47,272
179	Erie ..	Completing excavation and incidental work near Pittsford	I. M. Ludington's Sons, Inc	11/ 9/17	91,409
180	Erie ..	Removing Rexford Flats aqueduct...	Dunbar & Sullivan Dredging Co	3/15/18	10,154
181	Erie ..	Waterproofing canal bottom at Little Falls	Law Brothers	12/28/17	48,223
182	Oswego	Completing excavation in front of dockwall below Lock 8, Oswego	E Brown Baker	8/30/18	27,228

CONSTRUCTION OF THE BARGE CANAL — (Continued)
 WORK COMPLETED, EXCLUSIVE OF THAT DONE UNDER CHAPTER 585, LAWS OF 1918, — (Concluded)

Con- tract No.	Canal	Description of work	Contractor	Date of contract	Total con- struction cost, includ- ing altera- tions and extra work orders
183	Erie	Aligning bridge at W Henrietta road, Rochester.	Donnell-Zane Co	9/11/18	\$5,505
184	Erie.....	Excavation under N Y C R R bridge at Brewerton	Mohawk Dredge & Dock Co	4/12/18	9,503
185	Erie	Channel improvement below dams at Scotia and Rotter- dam	Am P & Const Co (R Wetherill, Rec'r)	6/24/18	151,541
187	Erie	Bank protection between New London and Lock 22	Scott Bros	8/20/18	15,585
188	Erie	Completing excavation under Brewerton R R bridge	E Brown Baker	8/ 7/18	35,996
189	Erie.	Completing excavation and placing bank protection, Fair- port to Kings Bend	Lathrop, Shea & Henwood Co	12/ 6/19	18,562
190	Erie	Completing canal from Kings Bend to L V R. R. crossing, Rochester	Empire Engineering Co, Inc	3/30/19	244,307
191	Erie	Completing work on Contract 59 in river south of tem- porary dam	Empire Engineering Co, Inc	1/14/19	155,023
192	Erie.	Completing work on Contract 59 in Genesee Valley park and east guard-lock to Genesee river	Empire Engineering Co, Inc	1/22/19	593,286
194	Champlain	Completing work on Contract I-A, Crockers Reef to Port Edward	Brown & Lowe Co . .	5/24/20	36,791
197	Erie	Repairs to Dam 4 at Rotterdam	Dunbar & Sullivan Dredging Co	2/27/19	14,620
198	Erie	Highway bridge below Lock 28-A, Lyons	Stewart Bros	8/25/19	39,341
200	Erie	Steel sheet-piling, etc., between Rochester and Lockport	Lupfer & Kemick	2/20/19	128,847
201	Erie	Completing concrete lining at Cartersville and stream entrance near Knapp's bridge	I M Ludington's Sons, Inc	3/13/19	50,782
204	Erie	Dam across old canal, Lexington Ave., Rochester	I M Ludington's Sons, Inc	3/19/20	3,168
205	Oswego	Concrete spillway below Lock 3, Fulton	Scott Bros	3/30/21	40,465
206	Erie	Raising bridge over Lock 33, Rochester	Groot Engineering Co, Inc	8,31/21	3,667
207	Erie	Removing material from prism, Orr's bridge, east of Holley	Byron, Forman & Riggs, Inc	1/ 4/22	5,022
Total					\$86,921,972

WORK COMPLETED ON THE ERIE, CHAMPLAIN AND OSWEGO CANALS UNDER CHAPTER 585, LAWS OF 1918*

Tables of Contracts

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Contract No	Canal	Description of work	Contractor	Date of contract	Total construction cost, including alterations and extra work orders
1-A	Champlain	Completing portion of Contract 1, Crockers Reef to Port Edward	Holler & Shepard	8/ 3/14	\$212,255
19-A	Erie	Redredging Contract 19. . . .	Empire Engineering Co., Inc	11/ 3/16	240,923
21-A	Erie	Completion of Contract 21. . .	Walsh Construction Co	2/16/16	631,401
23-A	Erie	Completion of Contract 23. . .	Empire Engineering Co., Inc	5/20/16	984,058
29-A	Erie	Completion of Contract 29. . .	Eastover Construction Co., Inc	3/27/16	376,443
44-A	Erie	Completion of work at New London	Scott Bros	10/10/16	56,242
59	Erie	Rochester harbor and connecting channel	MacArthur Bros Co. . . .	11/ 3/16	1,900,868
63-A	Erie	Completion of Contract 63. . .	State Highway Const. Co	2/23/16	456,595
73-A	Champlain	Completion of Contract 73. . .	Great Lakes Dredge & Dock Co ..	1/15/16	580,096
84	Erie	Viaduct over the river at Clyde	Lupfer & Remuck	3/ 9/17	92,421
98	Erie	Left-bridge at Adams St and removing bridge at Chapel St., Lockport.	Tuft Construction Co., Inc	11/24/16	84,723
99	Oswego	Bascule bridge at Minetto	Larkin & Sangster	9/12/16	153,686
122-A	Erie	Completing Contract 122.	Chesley, Earl & Hembach, Inc	3/ 8/17	81,717
138	Erie	Movable dam, etc., at Rochester	Combined Construction Co	4/19/17	716,030
141	Erie	New power-station at Lock 29, Palmyra	W. F. Maas & Son . . .	3/ 8/17	27,193
159	Erie	Embankment between Newark and Palmyra and extending Ganargua creek spillway.	I. M. Ludington's Sons, Inc ..	3/27/17	40,046
		Total	\$6,634,097

* This was the act which recompensed contractors for losses sustained by reason of doing work under war conditions on contracts entered into before war was declared

CONSTRUCTION OF THE BARGE CANAL — (Concluded)
WORK UNDER CONTRACT BUT UNCOMPLETED OCTOBER 18, 1922

Con- tract No	Canal	Description of work	Contractor	Date of contract	Engineer's preliminary estimate	Contractor's bid
202	Erie	Completing excavation and placing protection, Genesee river, Rochester	James Stewart & Co., Inc Troy Public Works, Inc	5/ 4/22 6/12/22	\$3,003	\$339,902 27,387
208	Erie	Tamtor gate at Baldwinsville dam				
209	Erie	Raising Maguire's bridge approach within limits of Contract 62				
210	Erie	Spillway at south end, movable dam, Herkimer . . .	Mohawk Dredge & Dock Co	10/10/22	\$3,003	4,504
		Total			\$3,003	\$371,793

TOTAL CONSTRUCTION COST OF THE ERIE, CHAMPLAIN AND OSWEGO BRANCHES OF THE BARGE CANAL

ITEMS	Totals
Work completed exclusive of that done under chapter 585, Laws of 1918	\$86,921,972
Work completed under chapter 585, Laws of 1918	6,634,007
Work under contract but uncompleted, October 18, 1922	371,793
Special work	3,003
Schenectady-Scotia bridge	2,724,305
	500,000
Deduct bonds of the J R Shanley Estate Co., held by the Comptroller	\$97,155,170
Total	409,600
	\$96,685,570

WORK COMPLETED ON THE CAYUGA AND SENECA CANAL

Contract No	Canal	Description of work	Contractor	Date of contract	Total construction cost, including alterations and extra work orders
A	Cayuga and Seneca	Lock and dam at Cayuga	Scott Bros	12/30/10	\$352,845
A-r	Cayuga and Seneca	Dam repairs and fish ladder at Dam 1, Cayuga	The Sherman-Stalter Co	7/24/16	24,750
B	Cayuga and Seneca	Montezuma to Cayuga lake, Cayuga lake to Seneca Falls, Waterloo to Seneca Falls			
C	Cayuga and Seneca	Locks, dams, etc., at Seneca Falls	The Sherman-Stalter Co	12/29/10	1,313,169
D	Cayuga and Seneca	Dredging Seneca river, Demont's bridge through Waterloo	Larkin & Sangster	1/11/13	1,171,914
E	Cayuga and Seneca	Lock, dam, etc., at Waterloo	The Sherman-Stalter Co	2/24/14	948,530
F	Cayuga and Seneca	Highway bridges at Lake road	Cleveland & Sons Co	1/7/13	317,646
G	Cayuga and Seneca	Lock gates, valves, buffer-beams, needle-beam, Taunton and guard-gates, Locks 2, 3 and 4, Dam 2	Stanley Construction Co	7/20/14	127,400
H	Cayuga and Seneca	Excavating Cayuga inlet at Ithaca	Lupfer & Remick	11/24/14	102,296
I	Cayuga and Seneca	Watkins to Montour Falls	N Y State Dredging Corporation	12/22/11	218,479
J	Cayuga and Seneca	Bridge at Fourth St. and dockwall, Watkins	The Central Dredging Co	9/23/12	187,350
K	Cayuga and Seneca	Highway bridges at Ovid and Bridge Sts, Seneca Falls, and Washington St, Waterloo, and Kingston road	Chesley, Earl & Heimbach, Inc	11/27/14	45,122
L	Cayuga and Seneca	Highway bridges at Gorham St, Waterloo, and Kingston road	The Phoenix Bridge Co	10/30/14	60,480
M	Cayuga and Seneca	Power-plants, equipment, etc; Locks 1, 2, 3 and 4	Scott Bros	9/23/15	55,554
P	Cayuga and Seneca	Cut-off wall below walls of Lock 3, Seneca Falls	Lupfer & Remick	11/5/14	100,406
Q	Cayuga and Seneca	Pile dolphins on Cayuga and Seneca lakes	The Foundation Co	6/8/17	197,883
R	Cayuga and Seneca	Completing unfinished work on Cayuga and Seneca canals	W F Martens	3/3/19	5,092
R-r	Cayuga and Seneca	Extending core wall, Dam 2, Seneca Falls	The Sherman-Stalter Co	4/30/18	173,434
T	Cayuga and Seneca	Repairing sewer in Benton creek, Seneca Falls	Kennedy & Scullen Const Co, Inc	1/20/19	18,721
U	Cayuga and Seneca	Placing fill along river bank above dam, Seneca Falls	Smith-Soper	1/3/19	5,148
W	Cayuga and Seneca		J B Anglin	3/5/21	4,461
		Total		\$5,430,770

CONSTRUCTION OF BARGE CANAL TERMINALS

WORK COMPLETED UP TO OCTOBER 18, 1922,† EXCLUSIVE OF THAT DONE UNDER CHAPTER 585, LAWS OF 1918

Chapter 746, Laws of 1911, and amendatory laws

Con- tract No	Description of work	Contractor	Date of contract	Total con- struction cost, includ- ing altera- tions and extra work orders N. Y. Eng'g. & Arch.
1	Dockwall at Ithaca	New York State Dredging Corporation	Aug 21, 1912	\$40,535 76
2-P	Dockwall at Albany	Raymond Concrete Pile Company	Aug 30, 1912	140,474 79
3	Dockwall and grading, Little Falls	Patrick W. Mulderry	Nov 12, 1915	30,545 20
5	Dockwall and grading, Mechanicville	Æthna Engineering & Contracting Co	Aug 13, 1912	60,083 60
6	Dockwall and grading, Whitehall	E. Brown Baker	Sept 4, 1912	52,210 94
7	Dockwall and grading, Fort Edward	Albert M. Banker	Nov 22, 1912	46,995 70
7-A	Approach channel and harbor, Fort Edward	Aldrich & Hall, Inc	Oct 3, 1912	45,741 27
8	Dockwall and grading, Schenectady	New York State Dredging Corporation	Oct 14, 1912	140,255 30
8-P	Paving at Schenectady terminal	American Pipe & Construction Co	Oct 14, 1912	157,743 88
9	Dockwall and grading, Herkimer	James P. Kelly	April 15, 1918	65,452 69
10	Dockwall and grading, Fonda	Æthna Engineering & Contracting Co	Oct 2, 1912	8,192 51
10-P	Paving, Fonda terminal	American Pipe & Construction Co	Nov 25, 1912	57,180 42
11	Dockwall and grading, Ilion	Patrick W. Mulderry	April 12, 1918	8,054 40
12	Dockwall and grading, Amsterdam	Æthna Engineering & Contracting Co	Nov 25, 1912	54,728 79
12-P	Fence along roadway approach, Amsterdam terminal	American Pipe & Construction Co	Nov 25, 1912	59,808 02
13	Guard-lock and highway bridge, Schuylerville	Anchor Post Iron Works	April 16, 1918	1,355 25
14	Dockwall and grading, lower terminal, Troy	Kendar Engineering & Construction Co	Dec 29, 1914	1,78,283 37
15	Lock channel, basin, dockwall and grading at Utica	Walsh Construction Co	Jan 16, 1914	125,337 11
15-D	Drainage of terminal site at Utica	Eastover Construction Company	Jan 8, 1913	582,834 73
15-M	Lock machinery, Utica terminal	Mohawk Dredge & Dock Co., Inc	Aug 13, 1917	9,276 09
16	Dockwall and grading, Rome	Lupfer & Remick	Oct 31, 1917	37,069 72
16-P	Macadam pavement, Rome	M. A. Talbott Company	Nov 19, 1912	86,715 32
17	Raising dockwall and laying stone block pavement, Lockport	E. Brown Baker	June 4, 1917	4,169 50
18	Bulkhead and harbor at Gowanus bay	John Johnson Construction Co	Dec 4, 1912	48,906 80
19-P	Paving at Greenpoint and West 53d street	Geo. W. Rogers & Co., Inc	July 15, 1914	323,204 40
21-P	Paving, Erie basin, Buffalo	The Hastings Pavement Company	April 14, 1920	23,329 00
22	Dockwall at Fort Plan	Henry P. Burgard Company	May 6, 1918	13,066 00
23	Pier at Plattsburgh	Leary & Morrison Co	Mar 31, 1913	£22,839 44
25	Pier at Port Henry	D. L. Taylor & Co	Feb 24, 1913	120,512 40
		New York State Dredging Corporation	Aug 27, 1913	89,638 84

26-A	Completion of terminal at Rouses Point	Holler-LaDu Corporation	Nov 11, 1920	28,739 40
27	Dockwall at Frankfort	Atna Engineering & Contracting Co	Aug 27, 1913	41,249 16
27-P	Paving, Frankfort terminal	Patrick W. Mulderry	April 12, 1918	3,938 45
28	Dockwall and breakwater at Cleveland.	Barrally & Ingersoll	Feb 15, 1915	34,553 77
28-A	Protection of breakwaters at Cleveland	Eugene Dawley	Mar. 1, 1920	19,233 55
29	Proposed dockwall and breakwater at Constantia	Barrally & Ingersoll	Nov 27, 1914	3,400 00
30	Dockwall, hydraulic canal wall and roadway approach, Oswego, river terminal	Henry P. Burgard	Mar 24, 1916	101,789 20
33	Lake pier at Oswego	Empire Engineering Co., Inc	July 10, 1914	338,252 26
33-P	Paving at Oswego, lake terminal	Guy B. Dickson	May 7, 1918	11,329 00
34	Dockwall at Thomson ...	Champlain Engineering and Construction Corporation	Aug. 20, 1914	16,128 06
35	Dockwall at Crescent	Joseph P. Casey	Nov 7, 1914	9,146 37
36-A	Dockwall extension and freight-house at Cohoes.	Holler-LaDu Corporation	Nov 28, 1919	40,469 40
37	Dockwall, harbor and paving at Canajoharie	Holler and Shepard	Aug 26, 1915	31,504 34
38	Pier at West 53d street, New York city	I. J. Stander & Co., Inc	Oct 27, 1917	262,654 44
39	Grading terminal site at Albion	Fred H. Rhodey	Mar 29, 1917	2,718 40
40	Dockwall, harbor and approach, St. Johnsville	Scott Bros	Sept 20, 1915	25,542 01
41	Removing buildings and grading the terminal site at Troy, upper terminal	Eastern Storage Transfer & Wrecking Corp	Nov 29, 1918	7,480 80
42	Paving at Long Island City terminal	Leonard Paving Co., Inc	Nov 13, 1918	47,33 05
43	Dockwall, dredging, frame freight-house, Flushing	McFarland-Barton Company	July 25, 1919	163,789 71
44	Dockwall, Mott Haven	Geo W Rogers Co, Inc	June 8, 1917	181,456 77
44-P	Pavement at Mott Haven, Greenpoint and Gowanus bay	Asphalt Construction Co	May 13, 1919	79,720 38
45	Constructing a terminal at Halletts Cove ..	Mohawk Dredge & Dock Co, Inc	Nov 28, 1919	281,591 41
46	Dockwall at Weedsport	Scott Bros	Aug 31, 1915	11,702 37
47	Dockwall and pavement, Tonawanda and North Tonawanda ...	I. M. Ludington's Sons, Inc	Oct 5, 1915	36,901 92
49	Grading terminal at Spencerport	F. J. Mumm Contracting Co, Inc	Oct 8, 1915	1,354 30
50	Grading terminal at Holley	Rhoday & Clawson	Nov 12, 1915	807 75
51	Dockwall and roadway approaches at Medina	Fred H. Rhodey	Feb 16, 1916	4,862 83
52-P	Paving on Pier 6, East river, New York city	Scilian Asphalt Paving Co	June 13, 1919	11,252 00
54	Grading terminal site, Middleport ..	Hammond-Tracey Construction Co, Inc	Mar 27, 1917	1,052 25
55	Pier at Gowanus bay	Riverside Contracting Co.	Sept 4, 1917	500,410 28
56	Repairing Pier 5, East river, New York city	I. J. Stander & Co, Inc	June 28, 1918	20,704 30
57	Vaduct and approach to Rochester terminal ..	Chas Krehm	Feb 25, 1919	93,883 71
58	Building tracks and pavement at Troy, lower terminal ..	C. P. Bolland & Co	Dec 2, 1918	19,481 57
59	Approach tracks to pier, lake terminal, Oswego	W. F. Martens	May 6, 1918	5,391 41
60	Railroad and crane tracks on pier, lake terminal, Oswego	Walsh Construction Co	May 6, 1918	9,19 00
61	Approach tracks to Pier 1, Erie basin, Buffalo	Walsh Construction Co ..	May 15, 1918	10,787 60
62	Railroad and crane tracks on Pier 1, Erie basin, Buffalo.	Harry W. Roberts & Co	May 15, 1918	10,041 45
63	Pavement at Utica terminal	Robert Wetherill, Receiver for American Pipe & Construction Co	April 19, 1918	9,490 23
64	Railroad and crane tracks at Schenectady	Empire Engineering Co., Inc	April 24, 1918	11,022 44
66	Shore protection between Pier 2 and Lake street, Erie basin, Buffalo	Empire Engineering Co., Inc	June 29, 1918	12,409 13

* Work completed by Superintendent of Public Works.

† Date of compiling table

‡ Paid to State

CONSTRUCTION OF BARGE CANAL TERMINALS --- (Continued)

WORK COMPLETED UP TO OCTOBER 18, 1922,† EXCLUSIVE OF THAT DONE UNDER CHAPTER 585, LAWS OF 1918 (Concluded)

Chapter 746, Laws of 1911, and amendatory laws

Contract No	Description of work	Contractor	Date of contract	Total construction cost, including alterations and extra work orders
67	Approach tracks to Pier 2, Erie basin, Buffalo.	Walsh Construction Co	July 3, 1918	\$6,959 60
68	Railroad tracks on Pier 2, Erie basin, Buffalo.	Walsh Construction Co	July 3, 1918	6,270 30
69	Raze protection between Lake street and Slip No. 1, Erie basin, Buffalo	Richard C. Bush	Feb 27, 1919	8,475 53
70	Regrading buildings, Rochester	Geo. W. Chambers	April 9, 1919	* 3,500 00
71	Completion of viaduct approach to Rochester terminal	I. M. Ludington's Sons, Inc	Aug 24, 1920	365,178 38
76	Yard tracks, Erie basin, Buffalo	Mohawk Dredge & Dock Co	Sept 21, 1920	22,055 70
77	Dredging, Piers 5 and 6, Greenpoint, Long Island City	New Jersey Shipbuilding & Dredging Co	May 13, 1919	44,156 50
79	Bulkhead wall and foundations for grain elevator, Henry street slip, Gowanus Bay	Raymond Concrete Pile Co	Oct 21, 1920	377,699 68
80	Concrete foundation piers of grain elevator, Oswego	Brown & Lowe and Law Brothers	Nov 9, 1920	259,578 64
101	Stiff leg derricks at Albany, Whitehall, Little Falls, Rome, Lockport and Tonawanda	Mohawk Dredge & Dock Co, Inc	Dec 18, 1916	39,577 95
102	Semiportal cranes, Pier 6, East river	Edward F. Terry Mfg Co	Jan 21, 1919	41,406 75
103-A	Package freight conveyors at Schenectady and Pier 5, New York.	Brown Portable Conveying Machinery Co	Oct 3, 1917	10,102 60
104	Electrical equipment, Greenpoint	T. Frederick Jackson, Inc	June 10, 1920	22,611 78
105	Electric wiring, scales, etc., at Pier 6	Lord Electric Co	June 28, 1918	19,395 90
106	Tractor cranes at Erie basin, Buffalo, Tonawanda, Lockport (lower), Lyons, Syracuse, Oswego, Utica, Amsterdam, Schenectady, Troy, Pier 6, Long Island City	The John F. Byers Machine Co	Feb 14, 1918	77,210 00
107	Electrical equipment, Erie basin, Buffalo	I. Livingston & Co	Mar 4, 1919	28,685 91
108	Electrical equipment, Long Island City	T. Frederick Jackson, Inc	Nov 21, 1919	4,644 10
109	Capstans and trolley hoists, Pier 6, East river, W 53d St and Utica terminal lock	General Electric Co	Aug 2, 1918	18,755 00
110	Traveling wharf cranes, Pier 6, New York city, two Shaw 4-motor	Manning, Maxwell & Moore (Purchased by Supt of Public Works)	July 23, 1919	23,885 00
112	Trailers and hand trucks, Pier 6, Greenpoint, Mott Haven	Lansing Company	June 9, 1919	9,250 00
113	Capstans and trolley hoists, Greenpoint, Schenectady and Erie basin, Buffalo	General Electric Company	Oct 27, 1920	14,090 00
114	Cranes, Erie basin, Buffalo	Heyl & Patterson, Inc	May 29, 1922	1,300 00
114-A	Purchasing and installing extension to boom of one of cranes at Erie basin, Buffalo	Leonard Morey	June 20, 1919	5,292 52
117	Motor generators and switchboards, Mott Haven and Greenpoint	Walter H. Wilms	May 10, 1922	9,998 00
124	5-ton full portal revolving jib crane at Troy			

1225	5-ton full port, revolving jib crane at Oswego	Walter H. Wilms	May 10, 1922	9,998 00
1226	Clam-shell buckets, New York city	Contractors Trading Co., Inc.	May 23, 1922	2,770 00
1227	Lifting magnet equipment, Troy and Mott Haven	K. I. Chisby	June 1, 1922	4,190 00
1228	Frame freight-houses at Troy, Mechanville, Fort Edward and Port Henry	Collins Brothers	Dec 29, 1916	8,485 68
1229-P	Plumbing in freight-house, Troy	M. J. Flannery & Son	Dec. 26, 1919	673 00
1230	Frame freight-houses at Schenectady, Amsterdam, Ponda, Ilion and Frankfort	Kennedy & Scullen	Mar 12, 1917	19,485 82
1231	Frame freight-houses at Utica and Rome	Wm R. Kinnney	Mar 14, 1917	13,065 43
1232	Frame freight-houses at Spencerport and Holley	J. B. McCabe & Son	Jan 29, 1917	1,397 50
1233	Heating system, freight-house on Pier 6	I. J. Stander & Co., Inc	Jan 11, 1918	128,500 22
1234-H	Plumbing and water-supply systems, freight-house, Pier 6	Miller & Brady, Inc	Mar 22, 1918	2,664 26
1235-P	Frame freight-houses at Tonawanda and North Tonawanda	Jarcho Bros., Inc	April 16, 1918	7,334 88
1236	Frame freight-houses at Tonawanda (upper and lower)	Kennedy & Scullen Construction Co	May 7, 1917	9,398 36
1237	Frame freight-houses at Lockport (upper and lower)	G. J. & P. L. Metzger	June 1, 1917	7,334 88
1238	Frame freight-houses at Newark, Albion and Medina	Savage Construction Company.	June 4, 1917	7,542 64
1239	Permanent freight-house on Pier 1 Erie basin, Buffalo	W. F. Martens & Co., Inc	Nov 14, 1918	8,044 48
1240	Heating system, freight-house, Erie basin, Buffalo	Fulton Construction Corporation	Nov 14, 1918	8,044 48
1241	Heating system, freight-house, Erie basin, Buffalo	Power Efficiency Corporation	Dec 6, 1919	3,540 00
1242-H	Plumbing, freight-house Pier 1, Erie basin, Buffalo	James J. Bresnahan	Dec 6, 1919	3,322 00
1243-P	Frame freight-house and timber derricks at Syracuse	Savage Construction Co	Feb 14, 1918	26,718 22
1244	Frame freight-house and paving at Amsterdam	Kennedy and Scullen Construction Co	Apr 16, 1918	15,044 02
1245	Frame freight-house on Pier 2, Erie basin, Buffalo	Savage Construction Co	Oct 9, 1918	12,065 00
1246	Freight-house and crane track, Long Island City, N. Jane St.	A. E. Norton, Inc	Oct 23, 1918	84,335 27
1247	Plumbing system, freight-house, Long Island City, N. Jane St.	Altman Plumbing Co	May 20, 1919	4,315 64
1248-P	Freight-house at West 53d street, New York city	Donnell-Zane Co., Inc	May 13, 1919	45,592 66
1249	Freight-house at Gowanus bay	Spaare & Trest Co	Apr 30, 1920	606,879 81
1250-H	Heating system, freight-house, Gowanus bay	George Gibson & Co, Inc	June 1, 1921	4,509 80
1251-P	Plumbing system, freight-house, Gowanus bay	Wm Young Plumbing Co	June 1, 1921	5,918 00
1252-W	Water-supply system, freight-house, Gowanus bay	Thomas E. O'Brien, Inc	Nov 26, 1921	7,061 00
1253	Frame freight-house extension at Utica	James T. Young	Aug 12, 1918	5,1324 40
1254	Frame freight-house extension at Little Falls and frame freight-house at Herkimer	Kennedy & Scullen Construction Co	Aug 30, 1918	6,293 21
1255	Frame freight-house at Greenpoint	J. A. Laporte	Aug 23, 1918	4,200 40
1256	Plumbing system, freight-house, Greenpoint	Post & McCord	Mar 20, 1919	78,467 32
1257-P	Freight-house at Mott Haven	Thomas E. B. Brien, Inc	Sept 10, 1920	10,395 00
1258	Head-house, West 53d St pier, New York city	Post & McCord, Inc	July 29, 1920	147,442 31
1259-H	Heating, West 53d street head-house	Fox, Reynolds Co., Inc.	Dec. 5, 1919	58,128 62
1260	Frame freight-house, Oswego, river terminal	Austin Engineering Co	Nov 12, 1920	5,119 00
1261	Frame freight-house at Gowanus bay	J. A. Laporte	Apr 28, 1919	5,030 58
1262	Frame freight-house at Rochester	J. A. Laporte	Apr 28, 1919	9,305 20
1263-H	Extension to frame freight-house, Rochester	W. F. Martens.	Dec 27, 1921	13,700 50
1264-A	Extension to frame freight-house, Rochester	Henry B. Reed.	April 5, 1921	9,531 85
1265	Foundation for permanent freight-house, Rochester	New England Foundation Co., Inc.	Nov 11, 1920	30,651 46
1266	Freight-house at Brockport	P. W. & J. J. Crouch	Jan 14, 1922	2,065 50
1267	Total			\$8,137,186 14

* Paid to State † Date of compiling table

CONSTRUCTION OF BARGE CANAL TERMINALS — (Continued)
 WORK COMPLETED UNDER CHAPTER 585, LAWS OF 1918 *
 Chapter 746, Laws of 1911, and amendatory laws

Contract No	Description of work	Contractor	Date of contract	Total construction cost, including alterations and extra work orders
19	Bulkhead and pier at Greenpoint	McHarg-Barton Company	Nov 24, 1916	\$289,663.95
20	Channel, harbor, piers, bulkheads and highway bridge at Syracuse	Walsh Construction Company	Nov 14, 1915	648,883.55
21	Piers and harbor, Erie basin, Buffalo	Empire Engineering Co., Inc	Nov 14, 1915	527,856.37
22	Permanent freight-houses at Lyons	John E. Byron & Co	Jan 30, 1916	23,456.37
31	Dockwall and frame freight-house at Lyons	Lupfer & Remick	Oct 30, 1916	56,544.08
36	Dockwall at Cohoes	Troy Public Works Company	Sept 30, 1916	30,611.43
48	Dockwall at Rochester	Charles E. Wilson	Mar 27, 1917	94,766.44
52	Repairing and extending Pier 6, East river, New York city	Kaufman and Gray	Oct 19, 1916	135,004.70
53	Dockwall and bascule bridge at Ohio basin, Buffalo	Walsh Construction Company	July 27, 1916	480,420.19
201	Permanent freight-houses at Albany and Whitehall	J. A. Laporte	Oct 27, 1916	84,270.00
	Total		Jan 2, 1917	\$3,154,857.18

* This was the act which recompensed contractors for losses sustained by reason of doing work under war conditions on contracts entered into before war was declared

WORK UNDER CONTRACT BUT UNCOMPLETED OCTOBER 18, 1922
Chapter 746, Laws of 1911, and supplementary laws

Tables of Contracts

573

Contract No.	Character of work	Contractor	Date of contract	Contract price as modified by alterations
53-A	Completing certain portions of dockwall, Ohio basin, Buffalo....	Great Lakes Dredge & Dock Co	Dec. 27, 1920	\$435,000 00
81	Gran elevator at Gowanus bay	Pegles Construction Co., Ltd	May 3, 1921	1,507,420 04
84	Clarissa street approach, Rochester	I M Ludington's Sons, Inc	Sept 7, 1921	63,309 00
86	Fences at Gowanus bay, Greenpoint and West 53d St., New York city	Leon Gottlieb Iron Works	Mar 18, 1922	8,782 50
87	Pence at Little Falls terminal	American Fence Construction Co., Inc	Mar 14, 1922	4,093 25
88	Paving, railroad and crane tracks, etc., Rochester terminal	I M Ludington's Sons, Inc	June 22, 1922	123,240 00
89	Paving, railroad and crane tracks, electrical work, etc., Syracuse terminal	J H Gallup	July 28, 1922	59,609 00
90	Dredging Henry street slip, Gowanus bay	Taylor Dredging Co.	Aug 1, 1922	19,085 00
115	Power equipment, Gowanus bay	The Croker National Fire Prevention Engineering Company, Inc	Jan. 7, 1922	57,359 99
116	Semiportal cranes, W. 53d St. and Greenpoint, New York city	Shepard Electric Crane & Hoist Co	Jan. 16, 1920	\$6,280 00
(Revised)				
118	Semiportal cranes, Gowanus bay	Lambert Hoisting Engine Co	Oct 11, 1921	25,590 00
100	Burtoning crane, Mott Haven	Lambert Hoisting Engine Co	Oct 11, 1921	11,580 00
(Revised)				
120	Cranes at Rochester	The McMyler Interstate Co	Jan 21, 1922	16,230 00
122	5-ton traveling bridge cranes, one each at Rochester and Syracuse.	Penn Bridge Co	May 9, 1922	\$8,300 00
128	5-ton full portal revolving jib crane, Erie basin, Buffalo	Walter H. Wilms	July 22, 1922	9,998 00
129	Lifting magnets, Schenectady, also Gowanus bay, Mott Haven, Greenpoint and Pier 6, New York city	K I Cusby	Aug. 29, 1922	9,590 00
130	Lifting magnets, Pier 2, Erie basin, Buffalo	Electric Controller & Mfg Co	Aug. 26, 1922	4,312 10
131	Four 20-ton auto truck scales, Gowanus bay, Greenpoint, Mott Haven, Long Island City.	The Fairbanks Co	Sept 12, 1922	8,364 25
132	One 5-ton full portal revolving jib crane at Mott Haven....	Walter H. Wilms	Sept 23, 1922	9,998 00
(Revised)				
133	One 5-ton full portal revolving jib crane, Ohio basin, Buffalo	Walter H. Wilms.	Sept. 11, 1922	9,998 00
134	One 5-ton full portal revolving jib crane, Syracuse	Walter H. Wilms	Sept 11, 1922	9,998 00

CONSTRUCTION OF BARGE CANAL TERMINALS — (Concluded)

WORK UNDER CONTRACT BUT UNCOMPLETED OCTOBER 18, 1922 — (Concluded)

Contract No.	Character of work	Contractor	Date of contract	Contract price as modified by alterations
135	Generator sets, one each at Albany and Troy	K. I. Clusby	Aug 20, 1922	\$3,000 00
136	Steel tanks, 23 at Waterford	K. I. Clusby	Aug 20, 1922	8,525 00
138	Locomotive crane, Long Island City.	W. H. Wilms..	Sept 20, 1922	8,000 00
230	Permanent freight-house at Rochester	W. F. Martens	July 7, 1921	182,399 25
230-H	Heating, Rochester freight-house	L. C. Gressens	Dec 26, 1921	7,295 00
230-P	Plumbing, Rochester freight-house	Arensmeier, Warnock & Zahmndt, Inc	Dec 17, 1921	4,177 00
233	Extension of pier shed West 53d street, New York city	McHarg-Barton Co	June 8, 1922	51,355 00
	Total			\$2,828,488 38

SUMMARY OF COST — CONSTRUCTION OF BARGE CANAL TERMINALS

ITEMS	Totals
Work completed up to October 18, 1922, exclusive of that done under chapter 585, Laws of 1918	\$8,137,186 14
Work completed under chapter 585, Laws of 1918	3,154,857 58
Work under contract but uncompleted October 18, 1922.	2,628,488 38
Total	\$14,120,531 70

CHAPTER XXXIII

TABLES OF ENGINEERS

State Engineers—Deputy State Engineers—Special Deputy State Engineers—Division Engineers—Consulting Engineers—Supervising, Resident and Senior Assistant Engineers, and Expert Engineers of Corresponding Rank—Assistant Engineers

THE names of the engineers of the grade of assistant engineer and higher ranks who have been connected with the State Engineer's department since the time of the preliminary Barge canal survey (1900) constitute the present chapter. It has been attempted to make the list complete even at the risk of including the names of some who were engaged on other work than Barge canal construction. Between 1900 and 1909 the building of State highways employed the time of a large part of the State Engineer's corps. Since the list contains all the names of the given grades in the whole department during those years, it is doubtless true that several men appear there who were engaged chiefly in highway work and whose connection with the Barge canal was rather slight or brief, or possibly who were not connected with it at all. It is not possible now without undue labor to determine just which are such names.

STATE ENGINEERS FROM 1900 TO 1922

Edward A. Bond	January 1, 1900, to May 1, 1904
Henry A. Van Alstyne.	May 10, 1904, to December 31, 1906
Frederick Skene	January 1, 1907, to December 31, 1908
Frank M. Williams	January 1, 1909, to December 31, 1910
John A. BenseL	January 1, 1911, to December 31, 1914
Frank M. Williams	January 1, 1915, to December 31, 1921 *

DEPUTY STATE ENGINEERS

Wm. Pierson Judson.	January 1, 1900, to December 31, 1904
Edmund F. Van Hoesen.	January 1, 1905, to December 31, 1906
Frank L. Getman	January 1, 1907, to December 31, 1908
H. W. DeGraff	January 1, 1909, to December 31, 1910
A. G. Chapman.	October 1, 1912, to December 31, 1914
Wm. B. Landreth	January 1, 1915, to December 31, 1918
R. G. Finch.	January 1, 1919, to December 31, 1921 *

* Term unexpired

SPECIAL DEPUTY STATE ENGINEERS

Henry C. Allen	May 12, 1904, to December 31, 1906
William R. Hill	January 1, 1907, to December 31, 1908
Wm B. Landreth	January 1, 1909, to December 31, 1910
A. E. Kastl	January 1, 1911, to July 31, 1914
D. B. La Du	August 1, 1914, to July 31, 1918
Friend P. Williams	January 1, 1919, to May 31, 1921

DIVISION ENGINEERS

Eastern Division

T. C. Leutzé	January 1, 1900, to October 14, 1901
H. A. Van Alstyne	November 1, 1901, to May 10, 1904
Chas. W. Trumbull	May 20, 1904, to December 31, 1906
J. J. Creeden	January 1, 1907, to June 30, 1907
L. B. Harrison	July 1, 1907, to December 31, 1908
George D. Williams	January 1, 1909, to December 31, 1910
John A. O'Connor	February 1, 1911, to December 31, 1911
D. B. La Du	January 1, 1912, to August 1, 1914
R. G. Finch	August 1, 1914, to December 31, 1914
George D. Williams	January 1, 1915, to July 31, 1919
E. D. Hendricks	September 1, 1919, to December 31, 1921*

Middle Division

W. H. H. Gere	January 1, 1900, to May 30, 1904
Charles O. McComb	June 1, 1904, to December 31, 1906
Henry B. Brewster	January 1, 1907, to December 31, 1908
Guy Moulton	January 1, 1909, to December 31, 1910
Edwin Styring	January 1, 1911, to December 31, 1914
Guy Moulton	January 1, 1915, to December 31, 1921*

Western Division

A. J. Rockwood	January 1, 1900, to December 31, 1906
John P. Kelly	January 1, 1907, to December 31, 1908
Thomas W. Barrally	January 1, 1909, to December 31, 1910
Edward J. Govern	January 1, 1911, to March 31, 1914
Friend P. Williams	April 1, 1914, to December 31, 1918
L. C. Hulburd	January 1, 1919, to December 31, 1921*

CONSULTING ENGINEERS

Henry C. Allen, 1916-21*	B. H. Davis, 1919-21*
Mortimer G. Barnes, 1907-11, 1911-15	Chauncey N. Dutton, 1900
Edward A. Bond, 1904-11	C. C. Egbert, 1909-21*
Wm. A. Brackenridge, 1904-11	Com. Alfred Brooks Fry, 1904-11
Wm. H. Burr, 1900-1; 1911-15	Henry Goldmark, 1900; 1917-21*
Dr. E. L. Corthell, 1904-11; 1916	E. P. Goodrich, 1917-21*
B. F. Cresson, Jr., 1917-21*	George S. Greene, Jr., 1900, 1911-15

* Term unexpired.

CONSULTING ENGINEERS — *Continued*

H McL. Harding, 1917-21 *	Edward P. North, 1900
Eugene E Haskell, 1916-21 *	Palmer C Ricketts, 1900
D J Howell, 1900-1	Joseph Ripley, 1909-18
Daniel C Kingman, 1900	Elnathan Sweet, 1900-1
Emil Kuchling, 1900; 1905	Col T W Symons, 1900-1; 1904-11
Wm B Landreth, 1918-21 *	T Kennard Thomson, 1911-15
T. C. Leutzé, 1900-1	H R Wait, 1920-21 *
E C Moore, 1916-21 *	Maurice W Williams, 1918-21 *
George S Morrison, 1900-1	George Y Wisner, 1900
Alfred Noble, 1901	

SUPERVISING, RESIDENT AND SENIOR ASSISTANT ENGINEERS, AND
EXPERT ENGINEERS OF CORRESPONDING RANK

H. D. Alexander	B. E Failing
Henry C Allen	Perry Filkin
Edward Anderberg	R G Finch
George C Andrews	C H Flanigan
T W Barrally	G Edward Gibson
John R Baxter	Carleton Greene
S W Belding	R S Greenman
O. F Bellows	
A. S. Berguist	George H Haley
E J Berry	E D. Hendricks
J H. Brace	J V Hogan
G M. Braune	Robert E Horton
A. E Broenniman	C H Hoyt
L D Brownell	J. T N. Hoyt
G M. Bull	L C Hulburd
James Burden	L S. Hulburd
Louis A. Burns	
	Charles A. Ingersoll
S. J. Chapleau	
George F. Chism	John R Kaley
A. A Conger	James E Kelley
A W. Conner	George T Kieth
Wm H Cushman	H. J. Knoppel
D. H Daley	D B. La Du
P H. Dater	E A Lamb
F C Davis	William B. Landreth
Wm Russell Davis	Emile Low
H W. DeGraff	
O J. Dempster	C. H. MacCulloch
Daniel B. Donovan	R J Marcher

* Term unexpired

SUPERVISING, RESIDENT AND SENIOR ASSISTANT ENGINEERS, AND
EXPERT ENGINEERS OF CORRESPONDING RANK — *Continued*

Charles J McDonough	H E. Smith
H. D. Miller	N Spencer
George C. Mills	A E Steere
Harry J. Morrison	G F. Stickney
T J Morrison	G. W Stickney
A. R. Morse	Edwin Styring
Guy Moulton	
	Earle Talbot
C R. Neher	
	G. G. Underhill
G. I. Oakley	
J A O'Connor	Henry A Van Alstyne
James J Overn	E F Van Hoesen
	W H Van Wie
M B. Palmer	
E V. R. Payne	Fred J Wagner
John G Peck	D. D Waldo
R E Phillips	D A. Watt
E J. Pickwick	W B Watson
C Arthur Poole	D. C Wedgeworth
	Harry A Weeks
J M C. Quarles de Quarles	Noble E Whitford
	M W Wilbur
O C Richards	W G Wildes
T M Ripley	H. P Willis
Dana W Robbins	Frank M Williams
	Friend P Williams
F N Sanders	Maurice W Williams
Fred W Sarr	George R Winslow
S M Savage	C H. Wood
H O Schermerhorn	
H. C. Smith	W. H Yates

ASSISTANT ENGINEERS

W. R. Abbott	Charles W Ashby
Arthur Adams	F C Ashley
C H Adams	C G Atkin
M. J Adams	Henry Auerbach
J Ray Aikenhead	A G Austin
H D. Alexander	E F Ayres
C R. Allen, Jr	
Edward Anderberg	J F. Bach
Elias H. Anderson	I S Badger
George C. Andrews	T. S. Bailey
A F. Armstrong	George F Baker
Hubert T. Arnold	H. W Baker
P L. Arnold	C L. Baldwin

ASSISTANT ENGINEERS — *Continued*

C L Bannister	Joseph P Burns
Philip C Baron	Louis A. Burns
T W Barrally	J Otis Burt
R. N Barrett	John L Bush
L Bartlett	
Charles Bauminister	R. W Cady
L G. Bayly	W L Caler
E J Becker	R D Cameron
S W Belding	Albert G. Card
H Bell	S F. Carlisle
J C. Bell	William H Carnrike
D E Bellows	H A J. Castor
O F Bellows	S J Chapleau
S R Bellows	A. G Chapman
H W Benedict	J. L Chapman
W C Benedict	C R. Chase
Louis R. Bennett	George F Chism
F A Biggi	C M Chuckrow
Harold Bills	John S Clancy
J S Bixby	A T Clark
L B Blade	Dorlon Clark
F E Blake	E. C Clark
H E Blake	L R W. Clark
R R Bradbury	H. L Clarke
George W. Bradley	Pitson J Cleaver
Joseph Brady	E. J Clohessy
H E Brainard	S Cohen
E A Brainerd	John D Colby
W C Bratton	C M. Cole, Jr.
H E Breed	Isaac O. Cole
S E Brettheimer	W L. Coler
Henry B. Brewster	R V Collins
George H Briggs	A W Conner
G M Briggs	David R Cooper
Frank W Bristow	Horace Corbin
G C Britton	Charles W Costello
Clark Brown	N E Cottrell
H H Brown	W. S. Coulter
Otto Brown	F H. Crafts
W W. Brown	W. G Craig
James K. Browne	Wm P Creager
L. D. Brownell	J H Crewell
F H Brundage	Foster B Crocker
P. H. Budd	Wm. W. Cronin
George M Bull	F. S Crowell
James Burden	C F Crowley
O L. Burdette	A G. Crysler
C. E Burleigh	F C. Curtin
	C A. Curtis

ASSISTANT ENGINEERS — *Continued*

Dewitt H. Daley
 P. H. Dater
 F. C. Davis
 J. C. Davis
 C. R. DeGraff
 H. W. DeGraff
 C. J. Dempsey
 O. J. Dempster
 W. H. Dernell
 Wayland Dickens
 F. J. Doerhoefer
 E. A. Dollard
 James Dollard
 Daniel B. Donovan
 J. B. Doughty
 E. J. Doyle
 J. B. Doyle
 R. E. Drake
 George L. Dunlop
 W. J. Durkan

 F. M. Eames
 G. Edson
 Charles M. Edwards
 Frederick Edwards
 Edward M. Ellis
 C. E. Elmendorf
 G. A. Ensign
 A. M. Evans
 M. D. Ewell

 B. E. Failing
 George A. Fairbanks
 W. F. Farley
 Perry Filkin
 J. C. Finch
 Martin A. Finch
 R. G. Finch
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 C. T. Fisher
 Lewis G. Fisher
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 Ely Gamse
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 R. C. Georger
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 Hall Gleason
 F. F. Gordon
 P. E. Green
 George E. Greene
 Harry H. Greene
 R. S. Greenman
 M. W. Grimes

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 E. C. Hackett
 L. L. Hadley
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 H. W. Hale
 George H. Haley
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 Edwin Hilborn
 R. B. Hoadley, Jr.

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	R. M. Mark
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L W Irish	L H Marsland
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D H. Judson	J. McBride
	R P McClave
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Harry Kehoe	C L. McClelland
James E Kelley	S B. McDonald
John P Kelley	C J McDonough
George D Kellogg	W S McDowell
H F. Kellogg	J H McElroy
W A. Kemper	F W. McKinney
E E Kendall	P F McLellan
B T Kenyon	Paul McLeod
Charles Kiehm	N. C McNeill
J. P. Kivlen	A. D Merrill
Homer C Kline	R H Merrill
F. C Koerner	Harold N Metzger
	C T Middlebrook
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H. J. Langlois	R. E Miller

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George C. Mills	C. P. Pengnet
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Foster B. Morss	C. A. Poole
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E. P. Neuschwander	E. G. Raynor
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A. T. O'Leary	H. Clyde Roe
H. J. O'Neil	C. H. Rogers
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D. W. Overocker	A. B. Samuelson
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M. B. Palmer	A. D. Sanderson
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O M. Severson	S M Stuart
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R. K. Sheldon	Rupert Sturtevant
Raymond K. Shelley	Edwin Styring
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Harry Shoemaker	C A Sullivan
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C. E. Smith	George H. Thomson
C V Smith	S R Tighe
H C. Smith	Frank C Tolles
Howard E. Smith	R. Tompkins
M. S. Smith	D. J. Tonkonogy
Reeves Smith	Frank T. Townsend
R W Smith	C. W. Trumbull
Wm H Snyder	
J L Southworth	G. G. Underhill
H. S. Sparr	
Herbert Spencer	H A Van Alstyne
Elwin G. Speyer	B. L. Vandervoort
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H. R. Starbird	C R. Vanneman
Burr M. Stark	W H. Van Wie
A E. Steere	
Smith O Steere	Fred J. Wagner
LeGrand Sterling	D. D. Waldo
H. J. Stevens	C R. Waters
J. H. Stevens	T L. Watkins
N J. Sievens	W. B. Watson
E. H. Stewart	Joseph Wechsler
Spencer J. Stewart	D. C. Wedgeworth
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H H.. Stickney	W. J. Weigmann
W M. Stieve	W. E. Weller
	E. W. Wendell

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S. M. Whitbeck	Maurice W. Williams
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Willard O. White	C. R. Winslow
David E. Whitford	M. W. Wolff
Noble E. Whitford	F. C. Woodward
L. H. M. Whitney	J. B. Wright
H. R. Wickham	
F. J. Wilbur	Joseph H. Young
M. W. Wilbur	Nathan E. Young
Waldo G. Wildes	
Frank B. Williams	
Frank M. Williams	W. D. Zielley
Friend P. Williams	M. E. Zipser

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